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Edited by
J. A. MALLETT

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COVER PICTURE
RED-FLOWERED GUM
(*Eucalyptus ficifolia* F. Muell.)
This tree is indigenous to a number of small areas between the Bowes and Shannon Rivers in the extreme South-West of Western Australia. It is known in every continent, being highly prized for its richly-coloured blossoms which appear in large trusses. It is closely related to the common red-gum or marri and to the mountain gum of the Jarrahwood district. Hybrid forms between the red-flowered gum and the marri are common in cultivation.

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Commercial Vegetable Growing

IN THE

PERTH METROPOLITAN REGION*

By L. T. JONES, B.Sc. (Agric.), Senior Plant Research Officer

MARKET gardening with sprinkler irrigation on deep sandy soils around Perth is really a commercial application of hydroponics or sand culture principles. Provision of a continuous and adequate supply of nitrogen is the major problem. Peat swamps scattered among the sandy areas have higher natural fertility. However, their common problems are drainage, acidity ("sourness"), salt and various special soil deficiencies. Over-liming of acid swamps can cause new problems.

Market gardening around Perth since the early days of settlement was concentrated in swampy areas, where a permanent shallow water table offsets the lack of rain during the dry summer period. With the introduction of sprinkler irrigation it moved on to the sand country until today it is estimated that only about 10 per cent. of the market gardening in the Perth area is confined to the swamps without irrigation.

This preference for coastal sand country is due to the ease with which good quality irrigation water can be obtained at shallow depths, the availability of electric power for pumping irrigation water, the proximity of the markets, cheaper cultural operations, freedom from frost, the cooling effects of summer sea breezes, rapid soil warming in the early spring and the better control of factors affecting growth conditions.

This shift has involved a greater use of fertilisers. Over the years many fertiliser investigations with vegetables have been undertaken but results, of necessity, must be discussed in general terms.

1.–COASTAL SANDS

These soils are inherently very infertile but under sprinkler irrigation and proper manurial treatment they can be made to produce, under our climatic conditions, high yields of good quality vegetables. It has been said that in this type of vegetable culture the sand acts mainly as a support for the plant. As the food and water requirements of the crop are supplied without depending on the fertility of the soil or the natural rainfall, it is in effect a large-scale commercial application of the principles of hydroponics, or sand culture.

The coastal soil types used for vegetable growing have been described by Smith (1). The Cottesloe association is used most extensively, the Karrakatta association to a much lesser extent and the Bassendean association to a very limited extent. Factors other than soil fertility appear to be mainly responsible for this preference.

The cost of installing sprinkler irrigation is fairly expensive. The cost of electricity for pumping irrigation water has

* Paper submitted to Vegetable Research Conference held at Warburton, Victoria, November, 1959, under the title "Soil Fertility Studies with Vegetables on Irrigated Sands and Peaty Swamps."

Fig. 1.—Ploughing typical sandy soil in the Balcatta area

been estimated at about £16 per acre per crop. The total fertiliser cost per acre per crop would be in the vicinity of £75 to £100. Although it is certain that some saving could be made in fertiliser costs growers are not inclined to depart from fertiliser practices which by experience have proved successful.

Most of our early fertiliser experiments with vegetables on sand country resulted as a consequence of the impact of fertiliser rationing during World War II. At that time certain basic principles were elucidated (2). Since then may specific problems have been investigated. There is still great scope for the investigation of trace element deficiencies and toxicities, organic manure substitutes, economy in fertiliser costs and optimum irrigation rates.

Our present state of knowledge can be concisely tabulated as follows:

ORGANIC AMENDMENTS

It is known from the results of soil-less gardening that we can grow vegetables by the continuous feeding of complete chemical fertilisers. The question therefore arises whether it is essential to use bulky organic manures. Local practical experience has shown that to obtain high yields and first quality vegetables on sand country it is safer, simpler and cheaper to combine the use of a bulky organic manure like horse manure with the addition of the more concentrated and more soluble mineral fertilisers such as superphosphate, sulphate of ammonia and muriate of potash. It is usually accepted that organic amendments play their part in intensive gardening by:—

(1) Supplying a continuous source of plant foods which are not easily leached out by rainfall or irrigation.

(2) Limiting the leaching of added mineral fertilisers.

(3) Improving the physical conditions of the soil.

Whatever may be the theoretical approach to this question the grower accepts the use of organic amendments as an essential part of his fertiliser programme for sand country.

In the past, horse manure at about 10 tons or more to the acre had been used extensively for this purpose. Horse manure is now scarce and expensive and it is necessary to find a suitable substitute. Such materials as sewage sludge, fowl manure, sheep manure, wool scouring waste, barley combings, spent hops, brewer's grains, etc., have been used.

Recently experiments have been commenced on the use of peat as a soil amendment (3). Results to date suggest that peat can be used as a substitute for horse

manure provided additional mineral fertiliser is used. Suitable large peat deposits are found adjacent to the market gardens and its occurrence lends itself to large-scale mechanical digging.

NITROGEN

The provision of a continuous and adequate supply of nitrogen under conditions of severe leaching from rain or excessive irrigation is the major problem. Organic manures such as blood and bone and fowl manure are used to provide a continuous supply of nitrogen which is less liable to be leached from the root zone.

The soluble nitrogenous fertilisers such as sulphate of ammonia and nitrate of soda are easily washed out of the soil and unless split applications are practised the crop will suffer from nitrogen starvation. Usually three separate applications of soluble nitrogenous fertiliser are used.

It is reasonable to assume that greater economy of soluble nitrogen fertilisers could result if the number of applications were increased and if the quantities applied at each stage were adjusted to coincide with the demands of the growth curve. Excessive irrigation or heavy winter rainfall can increase the amount of soluble nitrogenous fertilisers required. Growers use blood and bone manure at up to 30 cwt./acre and nitrate of soda or sulphate of ammonia at up to 10 cwt./acre.

PHOSPHORUS

Probably because of the large amounts normally applied and the additional use of bulky organic manures the leaching of superphosphate by irrigation or winter rain does not apparently present a practical problem. It is usual to apply 5 cwts. or more of superphosphate per acre and these amounts may be applied in one dressing or in three split dressings without affecting yields. Some cauliflower and cabbage growers use up to 1 ton of superphosphate to the acre. Very little work has been done on minimum phosphate requirements or the possible greater efficiency of split dressings.

MAGNESIUM

No authenticated case of magnesium deficiency is known, although several suspected cases have been investigated with negative results. Considering the soil conditions this is puzzling. Many growers use Epsom Salts as a precautional measure. Also many organic manures are relatively good sources of magnesium (4).

Fig. 2.—After ploughing, the newly-ploughed land is spread with spent hops which are then rotary-hoed into the soil, before planting takes place. Portion of this paddock is shown planted with cauliflowers. Note the typical tuart vegetation and the limestone outcrops

Fig. 3.—Cauliflowers growing at Balcatta

SULPHUR

Sulphur deficiency in market gardens has not yet been definitely recognised. On one occasion it was induced experimentally with a crop of cauliflowers by the sole use of a complete soluble commercial fertiliser which contained practically no sulphur. Typical symptoms were obtained and plant analysis confirmed the diagnosis. A dressing of superphosphate quickly corrected the symptoms.

In practice the use of superphosphate and other sulphur-containing fertilisers appear to ensure that sulphur deficiency does not occur even with the more susceptible crops such as cauliflowers and cabbages.

IRON

Iron chlorosis is fairly prevalent among tomato crops. Some chemical studies indicate that toxicities of copper zinc, manganese and phosphorus either singly or combined are playing a part in inducing iron chlorosis. In these cases affected leaves have a much higher iron content than normal leaves. This form of iron chlorosis has responded quickly to 0.2 per cent. foliage sprays of iron chelate. Lime-induced iron chlorosis in tomatoes is not controlled by the same iron chelate spray.

TRACE ELEMENTS

Many growers apply "minor element mixtures" which are either ready-mixed proprietary lines or compounded according to what they consider are their own special requirements.

Considering that only two trace element deficiencies, namely manganese and molybdenum, have definitely been confirmed experimentally, the wisdom of using complete trace element mixtures is open to some doubt. The question of toxicities could be a future problem as a result of their use. The use of bulky organic manures does tend to limit the occurrence of trace element deficiencies. (4).

MANGANESE

Manganese deficiency is very prevalent with a wide variety of crops. A leaf content of less than 15 parts per million of manganese usually indicates that a response to manganese treatment could be expected. It occurs most commonly on limy soils. Soil applications of about 56 lb. per acre of manganese sulphate if

broadcast and 10 to 20 lb. per acre for row placement is one method of control. A more popular method is to use a 1 per cent. manganese sulphate foliage spray.

MOLYBDENUM

Molybdenum deficiency has been reported on cauliflowers, rockmelons and cucumbers. The three published methods of control namely seed-bed, fertiliser and foliage spray are all used. There is a tendency for some cauliflower growers to use repeated heavy soil applications of molybdenum. A case is known of an oat crop grown after several molybdenum treated cauliflower crops which had a molybdenum content which exceeded the safe limits for stock.

BORON

Although many cases of suspected boron deficiency have been investigated, especially in cauliflower and celery, it has not been possible to prove conclusively, either from fertiliser application or chemical analysis, that the symptoms observed were those of boron deciency. Many growers apply borax dressings.

COPPER AND ZINC

No proven cases of copper and zinc deficiency are known. This is hardly surprising in view of the widespread use of copper and zinc fungicides.

IRRIGATION PRACTICES

Crops grown on sand country are irrigated daily during the warm weather. The suggested optimum rate of application would be from $\frac{1}{4}$ to $\frac{1}{2}$ an inch daily. Some growers, apparently unaware of the leaching effect of excessive irrigation, use a much heavier daily rate than this. Excessive irrigation is particularly wasteful of soluble nitrogenous fertilisers. Under these conditions organic nitrogenous manures make for better growth than the use of soluble nitrogenous fertiliser. Rates up to 4 in. of water per day have been measured in market gardens.

2.–PEATY SWAMP SOILS

The permanently wet swamp soils found in depressions between the sand dunes within the Cottesloe, Karrakatta and Bassendean asociations have been grouped by Smith(1) into the Herdsman association. Teakle and Southern (5) have reported on the extent and properties of these soils. For our purposes they can be conveniently placed in three main groups as follows:—

(1) Peaty sands.
(2) Acid peats.
(3) Marly peats.

Some of these soils are highly productive for vegetable crops. The two main advantages of the swampy soils are their better fertility and that it is not normally necessary to instal costly sprinkler irrigation. Fertilisers, although not applied at the heavy rates used on the infertile sands are still of great importance and special problems are encountered. Split dressings are not used to the same extent as on sand country although soluble nitrogen fertilisers are often added as side dressings for such crops as cauliflowers and cabbages.

Any of the trace elements may assume importance and of these copper and manganese deficiency are most frequently encountered. Liming acid peats may induce certain trace element deficiencies and markedly increase the supply of molybdenum. Generally growers are not fully aware of the importance of adequate potash fertilisers on most of these soil types.

The special problems encountered are discussed below:—

Soil Acidity.

The acid peats and acid peaty sands usually respond to a dressing of lime of about 5 to 10 tons per acre when the soil pH is below 5. On one acid peat, applications of 1 to 2 tons per acre of lime did not have a beneficial effect on the vegetable crops and soil pH values had not been raised when sampled after harvest. However, calcareous beach sand at 10 tons per acre proved adequate. This beach sand contained 85 per cent. calcium carbonate and 5 per cent. magnesium carbonate.

There appears to be a seasonal fluctuation, in some cases, in soil pH values covering a range of approximately half a unit. During the winter the pH value is highest and during the summer lowest (i.e., most acid in summer.

Plants grown on acid peats may suffer from metal toxicities and manganese

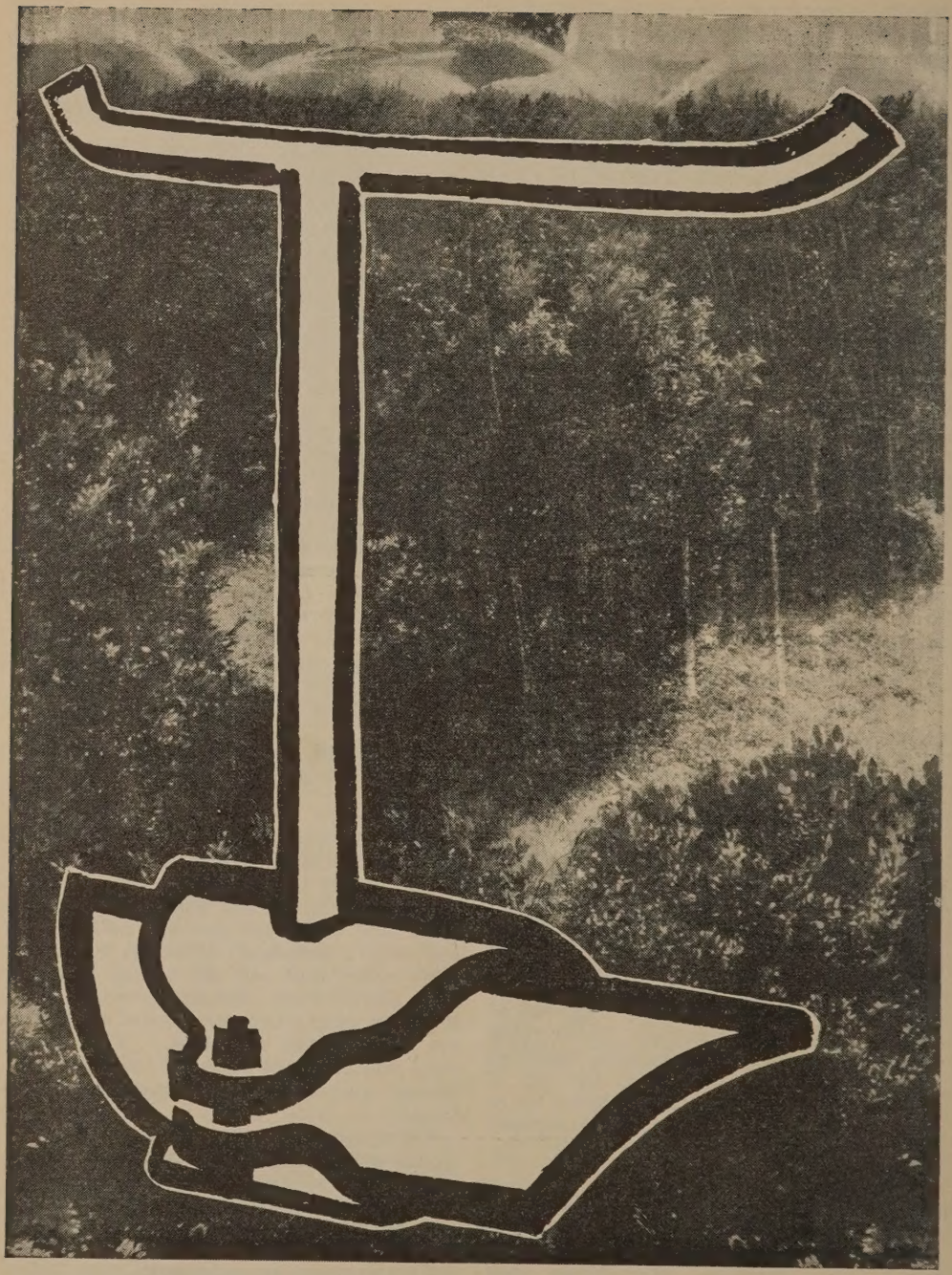

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Fig. 4.—Sprinkler irrigation as used in the area. A standard rain-gauge to measure the quantities of water applied is a worthwhile investment. Many growers apply too much water, causing rapid leaching of soluble fertilisers

excess is fairly common. Molybdenum deficiency causing "whiptail" in cauliflowers is very prevalent on acid peats and yet, after liming, the molybdenum content of the pasture plants may reach very high levels. On the more acid peats the root growth of vegetables and clovers is usually confined to the depth of influence of the applied lime and this may limit water and nutrient uptake.

While manganese toxicity can be a problem before liming, manganese deficiency is often induced after liming. Marly peats are very prone to manganese deficiency. The use of lime has induced the occurrence of "common scab" on potatoes and beetroot when soil pH was raised above 5.8. One grower has reduced "common scab" to reasonable proportions in potatoes under these conditions by the use of sulphur at the rate of 500 lb. an acre mixed with the fertiliser in the furrow.

Experience with acid peat soils has led growers to unconsciously select by trial and error such crops as potatoes, rhubarb and pumpkin which are more acid-tolerant.

Potash Deficiency.

Potash fertilisers can rarely be omitted in vegetable growing on peat swamps without the yield being reduced. It is essential that soil acidity be controlled and adequate drainage be provided before the most efficient use of potash fertiliser is obtained. Trials show that on a limed peat 2 cwts. per acre of muriate of potash was an adequate dressing while on unlimed acid peat even 4 cwts. per acre of muriate of potash gave only partial control of potash deficiency. Many examples are known where improved drainage has increased the uptake of potassium and removed potassium deficiency symptoms in pasture plants and vegetable crops. The symptoms were confirmed by chemical analysis.

A very common failing is that although potash is used it is not applied in adequate amounts. With "Potato Manures" containing 5 per cent. or 8 per cent. potash (K_2O) it is necessary to use 15 to 24 cwts. per acre of these mixed manures in order to apply the equivalent of 2 cwts per acre of muriate of potash.

DRAINAGE

Although this aspect will not be discussed at length nevertheless adequate drainage is an important factor in growing successful crops in swamps. Swamps are normally drained, but where waterlogged patches occur, the drains are usually not deep enough or placed too far

apart. In practice these waterlogged patches can suffer from soil salinity due to summer evaporation, or the restricted root growth may induce drought or reduce the uptake of plant nutrients.

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The old house and the property surrounding it now form portion of the Bundidup Research Station, Wokalup where new pasture and crop plants are tried out, where the Artificial Breeding Scheme was pioneered and where new farming methods are critically examined and reported upon.

The techniques have changed but the pioneering spirit still endures.

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BLACK SPOT OF TOMATOES

● **BLACK SPOT DISEASE IS THE MOST SERIOUS FOLIAGE BLIGHT OF TOMATOES IN THIS STATE. IN SEASONS FAVOURABLE TO ITS DEVELOPMENT SEVERE DEFOLIATION AND FRUIT ROTTING ARE EXPERIENCED.**

By R. F. DOEPEL, B.Sc. (Agric.), Plant Pathologist

IN Western Australia, black spot, which is also known as early blight and target spot, is a troublesome disease of long standing. It is caused by the fungus *Alternaria solani* which also attacks potatoes.

On tomatoes the disease has proved a limiting factor in the Geraldton district where early, main and late winter crops are grown. Not only is the yield and quality of the crop affected but serious wastage occurs in fruit transported overland to Melbourne markets. Late autumn crops at Balcatta, Osborne Park and Spearwood are also subject to black spot attack.

SYMPTOMS

Young plants attacked in the seedbed develop a collar rot of the stems at ground level (Fig. 1), a condition commonly referred to by growers as "black leg." If such plants escape notice and are transplanted into the field they become unthrifty and are often broken over by wind. If the soil is hilled up around the stems to induce adventitious rooting they may survive, but seldom develop into first-class plants.

On the foliage the disease appears first on the lower leaves shortly after the plants are set out in the field. It becomes obvious as irregular, dark brown spots often surrounded by a yellowish margin (Fig. 2). The spots may enlarge up to half an inch in diameter and, if numerous, cause affected leaves to die and hang downward against the stem.

The fungus also attacks the stems and laterals and produces dark brown oval cankers.

Fruits are infected at all stages of development and subsequently a typical black rot is produced (Fig. 3). The decay is most commonly observed on the stem end of the fruit adjacent to the stalk scar.

SURVIVAL AND SPREAD

The black spot fungus can survive from one season to the next in infected crop residues in the soil. Minute spores produced by the fungus are spread by wind and soon establish the disease in new plantings.

If seed is extracted from infected fruits, contamination with spores may occur dur-

ing the process and this also assists in disease carry-over.

Fig. 1.—Seedling affected with collar rot

Wet weather conditions and moderate temperatures favour rapid build-up of the disease in field crops. These conditions frequently prevail at Geraldton during the winter months and are responsible for serious outbreaks of black spot in the main plantings. Subsequent killing of the foliage before the end of the season reduces both yield and quality of the fruit.

CONTROL MEASURES

The following measures are recommended for reducing losses due to the black spot disease.

Fig. 2.—Leaf showing spots typical of the disease

1. Seed should be immersed in hot water at 126° F. with 0.25 per cent. commercial formalin added (1 fluid ounce or 2 tablespoonsful in 2½ gallons water) for 25

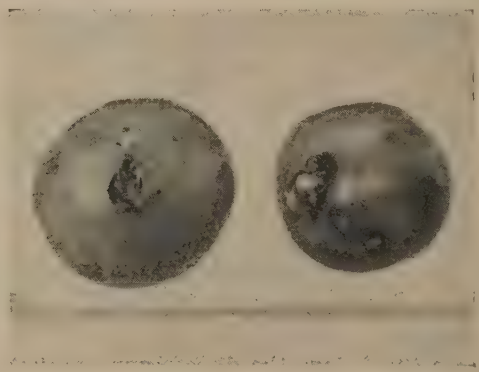

Fig. 3.—Tomato fruits affected with black spot

minutes. It should then be removed and spread out thinly to dry in the shade. The hot water seed treatment is also of value in controlling the bacterial canker disease.

2. Prior to planting, the seed should be dusted with an organic mercury dust (¼ to ½ level teaspoonful per lb.) to guard against attack by soil-borne fungi.

3. As a supplement to the above measures new or sterilised soil should be used for the seedbed each year.

4. Because the fungus lives over in plant refuse in the soil all crop remains should be burnt at the end of the season and the land rested from tomatoes for at least three years.

5. Plants should be sprayed with a zineb-type fungicide at regular ten-day intervals during the susceptible period. However this interval may need to be reduced to five days when weather conditions become very favourable for disease development. The recommended spray strength is 2 lb. of fungicide in 100 gallons of water. Zineb fungicides are available under such trade names as "Dithane -Z78," "Zebtox," Zineb," etc.

ROOT-BOUND SHRUBS

The illustrated garden shrub (Cotoneaster) strangled itself with its own roots. When purchased several years earlier it had been in the pot too long and the young roots, not being able to grow straight down had spiralled round and round in the pot. It grew well after transplanting in the garden but as the trunk and roots thickened with age, the constriction became worse till the sap flow eventually stopped. Death of the shrub was preceded by a gradual dieback of branches.

To avoid disappointment, home gardeners should never purchase large plants in small pots because numerous other shrubs, including Victorian ti-tree are subject to this condition. Shrubs raised for sale should be transferred from time to time into large containers to prevent them from becoming root bound.

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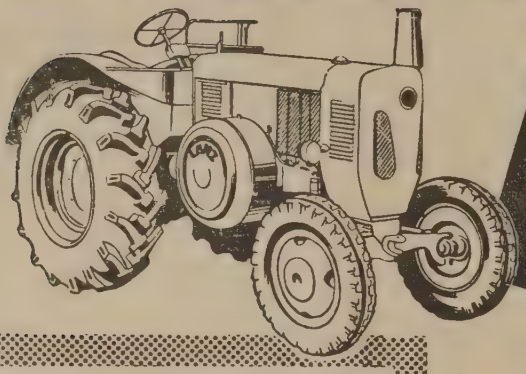

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Time of LAMBING

by

W. L. McGARRY
Officer-in-Charge, Sheep and Wool Branch

and

I. K. STOTT, B.Sc. (Agric.)
Sheep and Wool Adviser

THE time chosen for lambing depends on many factors, and the final decision rests with the individual flock-owner who has to consider how different times fit in with the overall programme of farm operations; how they will influence the marking percentage, the marketing, the thrift of his sheep and most important, how they influence the profit from his sheep operations.

Over most of the agricultural areas of Western Australia we have, for years, accepted an autum drop of lambs. When this decision was made it was probably arrived at after much thought, but today, in the light of improved pastures and knowledge of sheep husbandry, alternative times for lambing should be considered.

In recent trials at Esperance Plains Research Station using Corriedale ewes and rams, some different lambing times were compared. The comparison was mainly between the standard autumn system and a spring drop.

The results of the three years' trial which commenced in 1956 are as follows:—

In 1956 different lambing times were compared, but in addition the relation between shearing and lambing was considered, resulting in three treatments.

Group 1—

Were autumn (March) shorn before an autumn (mid-May) lambing.

Group 2—

Were spring (September) shorn for an autumn (mid-May) lambing.

Group 3—

Were autumn (March) shorn for a spring (mid-August) lambing.

Results were :—

	Group 1	Group 2	Group 3
Number of ewes	50	50	50
Per cent. lambs dropped	100	100	118
Per cent. lambs marked	82	78	86
Weaning weight of lambs	76 lb.	71·2 lb.	73·6 lb.
Greasy wool weight of ewes	14·23 lb.	13·52 lb.	14·25 lb.
Value of wool per head	£4 17s.	£4 6s. 7d.	£4 9s. 2d.

With the spring drop the marking percentage was 4 per cent. higher and the births 18 per cent. higher than the autumn drop. The time taken for lambing in the spring was three weeks compared with 14 weeks.

Weaning weights did not vary much but were in favour of group 1 (shorn approximately six weeks before an autumn lambing).

Autumn-shorn ewes produced more greasy wool and a greater return than the spring-shorn. The autumn-shorn wool was dustier, but higher-yielding. Grass seeds were not a serious problem.

In 1956-57 the trial was repeated in a modified form. Only two groups were included.

Group 1. Spring (October) shorn, autumn (mid-June) lambing.

Group 2. Autumn (January) shorn, spring (September) lambing.

Results	Group 1	Group 2
Number of ewes	100	100
Per cent. lambs dropped	121	100
Per cent. lambs marked	72	87
Weaning weight of lambs	62·8 lb.	50·3 lb.
Greasy wool weight of ewes	10·76 lb.	10·12 lb.

The results from this year were very inconclusive.

Group 1 contracted "phalaris staggers."

Several ewes (10) died as a result, and indirectly through the ewes being affected, a number of lambs (49) died. Because of this the value of the wool was not obtained for this year.

It is worth noting, however, that the so called autumn lambing group were mated in January to lamb in June, and that the percentage drop (conceptions) in this group was very high. It is presumed that the marking percentage would have been relatively higher had the ewes not contracted "phalaris staggers." Also that the spring lambing group were mated in April (one month later than the previous year) to lamb in September, and that their weaning weights were low in comparison with the previous year.

In 1957/58 a further two groups were compared:—

Group 1. Autumn (March) shearing, spring (August) lambing.

Group 2. Spring (September) shearing, autumn (May) lambing.

Results	Group 1	Group 2
Number of ewes	50	50
Per cent. lambs dropped	114	100
Per cent. lambs marked	108	92
Average birth weight of lambs	9 lb. 13 oz.	9 lb. 1 oz.
Weaning weight of lambs	70·3 lb.	73·6 lb.
Greasy wool weight of ewes	11·8 lb.	10·12 lb.
Value of wool per head	£2 12s. 8d.	£2 9s. 4d.

Again this year the later lambing proved superior. A higher marking percentage resulted. Birth weights in this group were greater and with the autumn shearing the ewes cut more wool and returned more per head. Weaning weights tended to be slightly lower.

DISCUSSION

These trials at Esperance were largely exploratory. They have, however, provided useful information which may serve as a guide to future work. It has to be accepted that the Esperance district has a later "finish" to the season than many of the older-established agricultural areas. Also that the sheep used were Corriedales which possibly would react slightly differently from other breeds.

Conception Rate. (Drop Per Cent.)

Later mating gave higher conception rates and a quicker rate of drop. Even in the season (1956-57) when the so-called autumn group dropped 121 per cent. the mating was in January for a June drop which is later than the usual November-December mating for an autumn (May) lambing.

These results are in accord with recent research on Merinos which show that the breeding season or readiness to mate increases as the length of daylight decreases, i.e., as the season advances towards autumn and the shortest day (June 21).

In other words the incidence of oestrus or heat tends to be low during the spring and early summer, rises to a maximum in autumn and declines during late winter.

It is interesting to note that whereas most breeds of sheep have definite breeding and non-breeding seasons the Merino can mate at any time of the year, although it has periods of suppressed oestrus when reproductive efficiency is generally low. The period of maximum oestrus follows the general pattern discussed above.

Marking Per Cent.

The per cent. of lambs marked to ewes mated is a vital factor in flock management. In Western Australia marking percentages generally are not good.

In these trials marking percentages were consistently higher in the later lambing (spring) groups.

Although conception rates influenced this to a large degree; conditions for the later lambing were generally more conducive to a higher marking percentage. Over a large part of the agricultural areas feed conditions are generally more favourable for lambs in August than they are in May.

Further, with the earlier May lambing, supplementary feeding is needed to ensure a rising plane of condition in the ewes approaching lambing time and to ensure adequate early lactation. This can be expensive—probably about 10s. per ewe. With the August (spring) lambing, feed conditions can be expected to be better and the need for supplementary feeding obviated. This fact was illustrated to some degree in 1957-58 when the birth weight in the August group was 9 lb. 13 oz. compared with 9 lb. 1 oz. in the autumn group, in spite of the fact that the autumn group received quite heavy supplementary feeding in late pregnancy and early lactation and the spring group received none.

Weaning.

In no year did the spring-dropped lambs wean as heavy at the same age as the autumn-dropped. Fat lamb raisers should take particular note of this point as a later drop (say August) could mean a lot of lambs not "finishing" and needing to be "carried over."

This problem of the effect on weaning weights is a factor to be considered. It could be even worse in areas where the season finishes earlier than it does at Esperance.

With Merinos it is not so important and can be met with preparations for adequate supplementations, which in any case is also necessary for autumn drop Merino lambs.

Shearing.

With a spring (August) lambing, consideration has to be given to the shearing time to avoid lambing and shearing clashing. In the trials at Esperance, for instance, the ewes that were mated to lamb in August were shorn in March. This did not affect the wool clip; in fact the returns from these ewes were better.

From the aspect of overall farm management, autumn shearing and spring lambing appear advantageous.

CONCLUSION

The time chosen for lambing depends on many factors. Every area and, in fact, every particular property can be in a different situation.

It was not the purpose of the trials at Esperance Plains Research Station nor is it the purpose of this article to make definite recommendations as to lambing times.

Rather, it is suggested that a re-examination of accepted mating and lambing times be made.

Mating should be at the time when the highest number of conceptions can be expected. These trials indicate that autumn mating for a spring lambing is superior in this respect.

But consideration must also be given to the feed and weather conditions that can be expected when the lambs drop and for the early part of their lives. The spring can give good early results, but for the later stages of the lambs' life may not be so suitable, especially at weaning time.

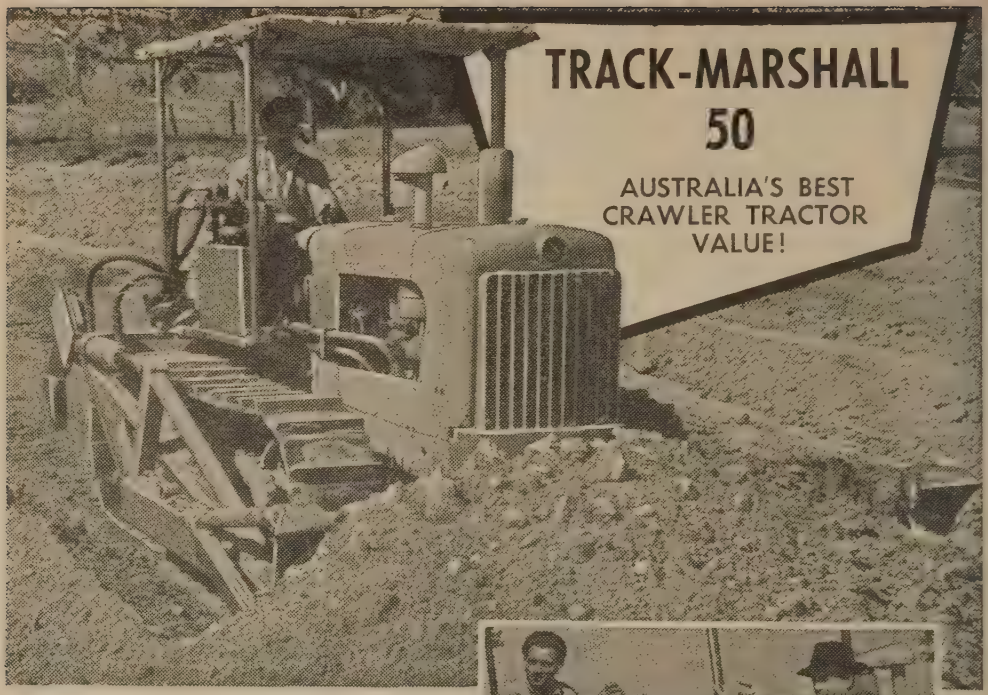
Sometimes a compromise has to be made between the ideal mating time and the ideal lambing time. This is the compromise that every flock-owner has to decide for his own particular situation.

Further trials are in progress comparing autumn and spring drops of lambs from Merino ewes under wheatbelt conditions.

FARMERS

This is YOUR Journal, and it has been written, edited and presented in a sincere endeavour to give you helpful information in an interesting manner.

We would like to have your views on the Journal—to know whether you like it or whether you don't. Drop a line to the editor and tell him the features you like and don't like in this issue—or the features you hope to see in future issues.



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"PULPY KIDNEY"

IS STILL A

SHEEP KILLER

Fig. 1—The hogget appears dazed and "dopy"

By F. C. WILKINSON, B.V.Sc., Veterinary Surgeon

ALTHOUGH considerable publicity has been given to methods of control by vaccination, numbers of sheep are lost every year in outbreaks of infectious enterotoxaemia—the disease commonly known as "pulpy kidney."

Under extreme conditions, this disease has been known to kill off up to 30 per cent. of a flock, but more commonly the losses range from 5 to 10 per cent. The cause of the disease is the rapid multiplication in the intestines of certain microbes which produce a powerful toxin or poison. This toxin is absorbed into the bloodstream and carried throughout the body, causing death within a few hours.

In most cases, affected sheep are found dead, without any preliminary symptoms being observed. The carcasses decompose rapidly and on being opened up, the kidneys will usually be found to have deteriorated to a dark red, pulpy mass—hence the popular term "pulpy kidney."

These three photographs show how the disease develops. The victim—a twelve-months-old ewe hogget—was found standing away from the flock in the morning and appeared "dopey."

The farmer had been losing a few sheep so he placed the animal in his utility truck and took it to a field day which was being being held in the district.

On arrival, the sheep was semi-comatose (see Fig. 1.). It made no attempt to move when approached and, if forced to move, would fall over and could not get to its feet without assistance. It remained propped against a fence for about half an hour.

About an hour after Fig. 1 photograph was taken, the animal collapsed, was unable to stand when lifted to its feet and lay with the head turned towards the flank (see Fig. 2).

Two and a half hours later, the animal was in a deep coma, unable to sit up and death followed soon afterwards (Fig. 3).

A post-mortem was carried out half an hour after the sheep had died. Internally, the sheep appeared normal except for a small amount of blood in the sac around the heart and small haemorrhages on the surface of the kidneys. The kidneys were not typically pulpy because the sheep had been opened soon after death. If the sheep

Fig. 2—An hour later the animal was unable to stand

Fig. 3—Two and a half hours after the first photograph was taken the animal lapsed into a coma and died

had been left for a few hours after death and then opened, the kidneys would have been dark red, soft and shapeless—typical of cases of enterotoxaemia seen on farms, where the sheep are usually found dead.

In this case, to prove the cause of death, some of the semi-fluid intestinal contents were taken back to the Department of Agriculture laboratory in Perth. Here the solid material was removed and the fluid portion injected into a rabbit. **The rabbit died 15 minutes after being injected.** This proved that a toxin was present, as similar material from a healthy sheep or from a sheep that has died of another cause produces no ill effects when injected into a rabbit.

This is a typical story of a sheep dying of enterotoxaemia, the term **entero**—referring to the origin of the toxin in the intestines and the **toxaemia**—referring to the coma and rapid death brought about when this toxin is absorbed into the bloodstream.

Full details of the disease and its course are given in Bulletin No. 2438 which may be obtained free of charge from the Department of Agriculture.

A Good Road Makes a Good Firebreak

Formed roads, regularly maintained and scraped, make good firebreaks. This excellent farm track is a good example — and it doesn't result in undue wear and tear on vehicles using it.

VIBRIOSIS

By

F. C. WILKINSON, B.V.Sc.,
Animal Division

AN all-too-common problem on dairy farms is the failure of cows to conceive at times which will ensure their calves being born at the desired season—when the cows can take full advantage of the flush of green feed or, in the case of wholemilk producers, at a time when the milk is most needed to maintain their quotas. There are of course many causes of sterility in cattle but in a survey carried out by veterinarians D. Roberts and M. Sier in 1957, it was shown that vibriosis was the main cause in 75 per cent of the herds investigated.

Vibriosis is a disease which is transmitted from one animal to another during service. A bull serving an infected cow will become infected and will in turn convey the infection to other cows.

Where the infection gains entry to a "clean" heard the cows continue to return to the bull time after time. Eventually they develop a resistance to the disease and commence to breed again, but they still continue as carriers and can infect "clean" bulls mated with them. Any young heifers mated with such infected bulls will contract vibriosis and fail to breed successfully until such time as they have become tolerant to the infection.

TWO APPROACHES

The dairy farmer with an infected herd has two courses of action available to him. Firstly his immediate aim should be to overcome the disease sufficiently for his cows to get into calf. Secondly his long-range objective should be to develop a vibriosis-free herd—and to keep it that way.

To attain the first objective he must enlist the aid of a veterinary surgeon who can inject antibiotics into the womb (uterus) of the cow. The womb is connected with the vagina by a narrow muscular canal through which fluid medicaments will not pass unless introduced through a special tube or catheter.

Because there are numerous folds in the canal, the passing of the catheter is a difficult operation and one which the farmer should not attempt himself as he can permanently damage the delicate lining of the cows' reproductive organs. The farmer can of course place medicaments in the vagina but as they will not pass into the womb they will be useless.

The method of treatment should be discussed between the farmer and the veterinarian with the following points kept in mind.

When the placing of antibiotics into the womb was shown to be effective, herd treatments were carried out by veterinarians, in which all cows not in calf were treated, but results still varied according to the periods during which the injections were given.

Subsequent research showed that the the most successful results were achieved by injections given from 24 to 96 hours after service, and this finding opened up a new avenue for veterinary treatment of vibriosis.

It will readily be realised that, prior to this discovery, a farmer could be put to considerable expense in veterinary fees and mileage expenses if the veterinarian was summoned for the treatment of individual cows.

It will also be realised that, if the veterinarian pays twice-weekly visits to the herd for a period of three weeks—a total of six visits—he will be able to treat all the cows in the herd at the most opportune times, that is up to four days or 96 hours after service.

This means that the farmer knows beforehand exactly what the cost of treatment will be. There will be the fees and mileage for six visits, plus an extra charge for medicaments, etc., for each cow treated. On at least two dairy farms in this State at which herds have been treated on these lines, the farmers concerned have expressed themselves as being very pleased with the results.

Even with veterinary costs thus brought to a much lower figure, the annual expense involved is by no means light and the aim of every dairy farmer should be to develop a vibriosis-free herd.

Artificial insemination is the most satisfactory method of achieving this. All bulls at the Artificial Breeding Centre at Wokalup are carefully tested and shown to be vibriosis-free before they are accepted for use. As a further precaution, antibiotics are placed in the semen after collection so that in the unlikely event of vibrio organisms gaining access to the semen, they would be rendered harmless.

As a new sterile insemination pipette is used for each individual cow there is no chance of transferring infection from one cow to another during insemination.

This means that if artificial insemination is used exclusively, the vibriosis infection will gradually be eliminated as the older infected cows are culled and replaced by uninfected heifers.

This scheme sounds simple—as indeed it is—but in practice, the introduction of uninfected heifers presents some problems. It is often inconvenient to keep heifers round the dairy for insemination and the common practice is to run a bull with the heifers.

This bull MUST be uninfected, otherwise he will pass on vibriosis infection to heifers, causing them to return to the bull —and even when they are transferred to the artificial insemination herd there will be delays in conception as the vibriosis infection will still be present.

The problem can be overcome by purchasing a young bull which has never been used for service; keeping him until he reaches maturity; and then mating him only to virgin heifers. Do not make the mistake of using him on older cows, especially those which have proved difficult to get in calf.

THE TWO-HERD SYSTEM

Where artificial breeding services are not available, the problem of eradicating vibriosis from the herd is more complex. It involves maintaining two separate herds which are segregated at all times.

Virgin heifers are mated to a clean bull which must never be allowed access to infected cows, and all subsequent matings must be to clean bulls.

Infected bulls must be kept away from clean cows, and clean bulls kept from infected cows and the segregation must be maintained over a long period.

Under most conditions of farming it is difficult to prevent accidental matings of a clean cow with an infected bull or a clean bull with an infected cow, yet such an occurrence could nullify years of careful work and cause a breakdown of the eradication campaign.

Nevertheless it is possible to eradicate vibriosis by these methods. If vibriosis is causing infertility and economic loss, it is possible to overcome the immediate problem by employing a veterinarian. By using artificial insemination or by introducing the two-herd system it is possible to eradicate the disease and save the expense of annual treatment.

HOME-MADE DOG BISCUITS

A supply of dog biscuits provides the answer to the average dog-owner's feeding problems and helps to eliminate the "feast or famine" conditions to which many farm dogs are subjected.

After killing a sheep, boil the heart, liver and lungs with any other scraps of meat that are available. Keep the liquor.

Put the cooked meat through the mincer and mix it with about 8 lb. of finely-ground wheatmeal or an equal quantity of bran and pollard. Use the soup liquor to bring the mixture to a stiff dough which is kneaded thoroughly and then rolled out flat and cut into squares. These are baked until hard and stored in an airtight tin.

Oatmeal, linseed meal, meatmeal and minced cooked vegetables may also be incorporated in the biscuit mixture.

FREE FEEDING

For the Control of Rabbits

By C. MARSHALL, Field Superintendent, Vermin Control Branch

IN common with most other farm work, the control of rabbits calls for a high degree of skill, patience and perseverance. There is no short cut to success, and if results are required we must be prepared to give of our best. Failures of control works are experienced at various times, and the reasons can generally be traced back to something we have failed to do or some short cut we have tried to take. However, we should not lose heart from one failure. During normal farming procedure, if a farmer's crop fails he does not give up planting in the future; in fact he tends to increase his efforts. The same should apply to rabbit control.

The free-feeding of rabbits prior to laying poisoned bait has often been the subject of heated discussions between farmers and V.C.Os. In recent years, following the introduction of "1080" poison, we have seen a steady build-up of resistance from a section of the landholders who claim that free-feeding as recommended by this Department is unnecessary. This attitude has disrupted the efforts of our organisation and generally has helped to break down a well-established and very necessary procedure for successful control work.

In advocating free-feeding, the Protection Board is not trying to introduce its own private theories, but a procedure that has been tried and recommended by farmers, technicians and research workers all over Australia—in fact all over the world. Free-feeding does not apply to rabbits alone. Experiments have proved conclusively that in planning the destruction of most animals by the use of poison baiting, free-feeding greatly improves the final results. In the case of rabbits it is a *must.*

In W.A. we recommend free-feeding for three days, then miss one day before baiting. The entire operation covers five days. The reason for this is to allow for all free-feed to be cleaned up before laying the poisoned bait.

WHY DO WE FREE-FEED?

All wild animals are naturally timid and therefore suspicious of anything strange. They also have set habits when feeding, and the rabbit usually has fairly well-defined feeding grounds. Because of this timidity the rabbit is quick to take fright if anything strange happens in the vicinity of his breeding or feeding areas. To overcome this timidity it is necessary to gain his confidence and the only way we can do this is by free-feeding.

The feed attracts a few rabbits on the first day, and providing it is maintained during the following two days, most of the rabbits in the vicinity will have developed the habit of feeding, with the result that when the bait is laid on the fifth day, a big percentage of them will take it freely.

If the same area was merely poison-baited without free-feeding, a limited number of rabbits would take the baits on the first day. Most of the remaining rabbits, after seeing their dead companions, would become suspicious and refuse the baits—in fact they may leave the area temporarily until they have forgotten their fright. This upset in habit would limit the kill to a percentage far below that required to maintain successful control.

METHOD

There is nothing complicated in free-feeding and the techniques have changed very little over the years. Successful free-feeding is well within the ability of all farmers to achieve. No costly equipment is required—just time and patience.

The following procedures should be followed:—

Have a good look over the area to be treated; locate the rabbits, also their harbourage and feeding grounds—this is important.

Then proceed to cut your trail between the feeding grounds and the harbourage, also around the harbourage where possible. Make sure you cover all infested areas; do not ignore small pockets—these too are important.

Your trail should be a clean-cut furrow about 4 in. wide and 1½ to 2 in. deep. A disc implement makes an ideal trail.

Sprinkle your free-feeding material along this trail. If using oats, the time of laying is not important; if using soft baits such as cut apple, try to leave the laying until the afternoon.

For the first day lay about 6 lb. to 8 lb. of free-feeding to the mile of trail. This amount is sufficient for a light rabbit population. If you feel the rabbits are more numerous, use up to 12 lb. of material per mile.

For the second day be guided by the amount of free feed untouched in the trail. If all is taken, increase the amount accordingly. If taken in patches, re-feed these spots.

The same procedure is followed during the third day. The important point to remember is this—if the feed is taken freely increase the amount each day. If not taken, do not add to the material already in the trail.

Miss the fourth day; do not go near the trail.

Bait on the fifth day laying about two-thirds of the amount used for the last free-feed. Do not lay bait over untouched free-feed. Bait all the bare patches in your trail. This is where the rabbits are feeding. It could be helpful in some cases to re-cut the trail before baiting. However, if this is done, care should be taken to closely follow the original trail.

Care should be taken to see that all materials used are clean and fresh; also that water and containers are not contaminated. Rabbits are most particular, and will not eat unclean food.

HYBRID TOMATO SHOWS PROMISE

A new hybrid tomato variety bred by the Department of Agriculture has shown a very low incidence of spotted wilt and gave very satisfactory yields of high quality round fruit which realised approxmately double the price of the standard "Early Crinkly" tomato grown under parallel conditions.

The new hybrid has been tested under commercial conditions by Mr. L. Buktenica, an Osborne Park market gardener, who grew about 4,000 plants of this variety. Apart from their popularity on the local market, the tomatoes found a ready sale in Melbourne where the fruit was in demand because of its firmness and good keeping qualities.

The new hybrid resulted from work carried out by the Department of Agriculture with the object of developing a disease-resistant tomato that was round-fruited and early-maturing and could satisfactorily replace the local "Early Crinkly" variety which has poor fruiting characteristics.

CATTLE LICE

SPRAY NOW FOR PREVENTION

By F. C. WILKINSON, B.V.Sc., Veterinary Surgeon

ALTHOUGH lice infestation can occur in any season of the year, the heaviest infestations are found during the winter. This build up of lice infestation normally starts in the autumn but if the cattle are treated by spraying at this period, the majority of the lice are killed and the build up is prevented. Thus the old saying "Prevention is better than cure" certainly applies with regard to cattle lice.

Beef and dairy cattle of all ages are liable to lice infestation and these parasites can be responsible for serious financial losses as their presence leads to retarded growth rates in young stock and reduced milk yields in milking cows. Cases have even been seen of infertility in severely-infested bulls. This is easily understood when it is realised that lice-infested animals spend must of the time, normally devoted to feeding and rumination, in rubbing and scratching to allay the irritation caused by parasites.

Four of the six species of lice recognised as affecting cattle in Australia have been seen in this State and as can be seen from the illustrations, both biting and sucking lice are represented. These lice can cause the following symptoms.

In heavily lice-infested animals which are constantly rubbing and scratching there is usually a marked loss of hair and the coat becomes rough and shaggy. In very bad cases the hairs of the coat become matted. The skin becomes dry and scaly so that large scabs or crusts may form, resembling the lesions of mange.

Lousy animals are restless, do not feed well and their reduced condition may make them susceptible to other diseases.

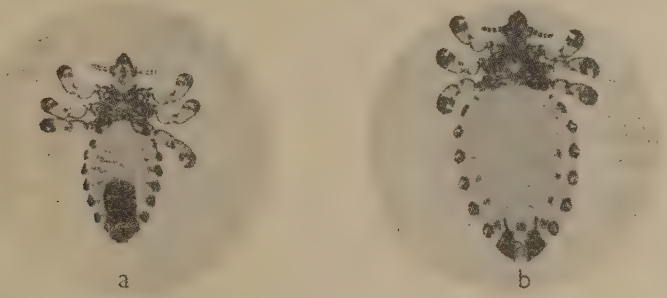


Fig. 1.—The Short-Nosed Sucking Louse. (a) Male; (b) Female
(After Kuth)

Lice infestation causes lower milk production in dairy cattle and leads to retarded weight gains, particularly in young stock. In the case of calves, lousiness leads to much licking of the coat, and since the hair is loose, hairballs form readily and frequently lead to internal disorders.

The constant drawing-off of blood and tissue fluids by sucking species of lice can lead to severe anaemia, and deaths from this cause may result when infestations are particularly heavy. Under the conditions experienced in the South-West of this State the lice populations commence to build in early winter when the pastures are low in nutritional value and when young cattle in particular find it difficult to obtain sufficient nourishment to keep them in a healthy condition.

Fig. 2.—The Long-Nosed Sucking Louse (After Kuth)

Fig. 3.—The Biting Louse of Cattle (After Helmsing)

To avoid these serious effects of lice infestation, it is important that control be instigated by spraying **all cattle thoroughly in autumn—THAT IS NOW.**

The most effective sprays available are dieldrin and B.H.C. preparations and these should be applied to all the skin surfaces, particular attention being paid to the under side of the animals. It is preferable to repeat treatment in 14 days to kill any lice which hatch out from the eggs on the skin and in the hair.

In conclusion, I would like to warn you against the economic loss which can occur due to lice infestation of your cattle during the winter months, and to reiterate that with little trouble or cost this loss can be prevented by action—NOW.

Fig. 4.—The Tubercle-Bearing Louse or Little Blue Sucking Louse.

AFGHAN THISTLE

(*Solanum hystrix* R.Br.)

Afghan Thistle is one of the few native plants to become troublesome weeds. It is not a true thistle but belongs to the potato family, which, besides cultivated plants such as the potato and tomato, includes thornapple, black nightshade and a number of other weeds.

WEEDS of Western Australia

By **G.R.W. MEADLY** M. Sc.
Officer in Charge, Weeds and Seeds Branch

AFGHAN THISTLE

(Solanum hystrix R.Br.)

DURING the summer months it is usual to receive many specimens of a prickly plant with blue flowers similar to those of a potato. It is commonly known as Afghan Thistle or Prickly Potato Weed. This plant is not a thistle, although it has the prickly foliage characteristic of many members of that group. The botanical name is Solanum hystrix which places it in the same family as the tomato, potato and tobacco. Relatives also include weeds such as the thornapples, black nightshade and apple of Sodom. The name Prickly Potato Weed, although somewhat unwieldy is therefore more appropriate than Afghan Thistle.

We look to some other country for the origin of most of our weeds. Local conditions have proved favourable for many plants from overseas, South Africa and the Mediterranean region having supplied a large number of pests. Very few native plants have displayed weed characteristics and most of them do not persist for any length of time following clearing, ploughing and cropping. There are of course, mallee suckers, sarsaparilla and some of our poison plants. To these must be added Afghan Thistle although native species are certainly in the minority when listing our weed problems.

DESCRIPTION

Afghan Thistle is a perennial which forms colonies. Plants which appear to be separate are in fact joined together by horizontal stems at varying distances below the surface. The plants rarely exceed 6 to 8 in. in height and the lobed yellowish green leaves 4 to 6 in. long are heavily armed with yellow spines. The blue bell-shaped flowers seldom reach one inch across and have a prickly calyx at the base. This calyx remains to enclose the green berry, about one half-inch in diameter, which becomes yellow as it matures. Flowering occurs in the spring and early summer.

SIGNIFICANCE

Afghan Thistle has been recorded from most centres in the wheatbelt extending from Geraldton and Mullewa to Borden and eastwards beyond Merredin. It favours lighter soils and grows quite vigorously in sand, especially on fallowed land, and has obviously been stimulated by clearing followed by spasmodic cultivation.

Besides being widespread, Afghan Thistle is firmly established in some districts. In the eastern wheatbelt in particular it occurs over many hundreds of acres. Further west the areas are generally smaller and the weed less aggressive but, even in such localities, farmers are justified in regarding it as a nuisance and a potential problem.

The green berries of some species of *Solanum* are toxic and it is possible that this applies to Afghan Thistle although no cases of stock poisoning attributed to it have been recorded. The prickly nature of the plant makes it unattractive to stock, but growth along railway lines suggests

that the ripe fruits are eaten and the weed spread by means of animals. During the summer months a green bite is at a premium in the wheatbelt.

CONTROL

The habit of the plant gives a warning that eradication is difficult. Deep-rooted perennials having a tendency to sucker always present a problem.

One farmer in the Midlands is satisfied that he can control Afghan Thistle on light land by cultivation. He uses a scarifier with 8 in. points to a depth of 4 to 5 in. in late October or November when the plants are commencing to make new growth. The cultivation is repeated when necessary and no flowering is permitted. Spectacular results cannot be expected and operations extending over several years may be necessary. It is advisable not to plough through an infested area but to treat it as a unit, as the implements can drag cuttings to clean parts of the paddock.

From the soil erosion viewpoint, summer cultivation is often undesirable, and a chemical method of control would have many advantages. Unfortunately Afghan Thistle is relatively resistant to the hormone-like herbicides but some useful results have been obtained with 2 lb. acid equivalent of 2, 4-D ester per acre applied in the spring when the plants are commencing to flower. In most cases the treatment must be repeated for several years, however, and would be scarcely practicable for other than restricted areas. It has been used to advantage for preventing isolated patches from developing into larger infestations and is the most satisfactory method for attacking plants growing on roadsides and railway tracks. Small areas can be destroyed by careful grubbing which should be repeated if new shoots appear.

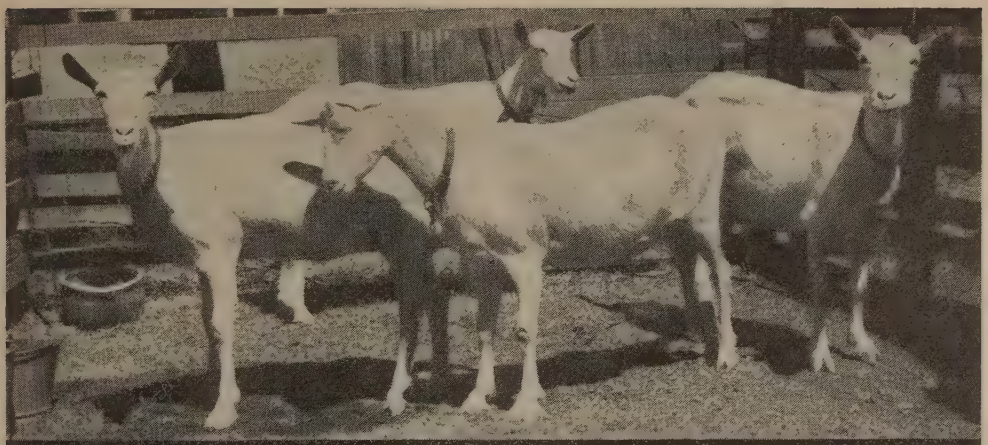
NEW BOOK ON WEEDS

We have received a book entitled "Weeds" compiled by J. N. Whittet, former Principal Agronomist (Pastures) of New South Wales Department of Agriculture. It is a volume in the Farmers' Handbook Series and was published with assistance from the Commonwealth Extension Services Grant.

It deals with various aspects of weeds including botanical characteristics, methods of distribution, undesirable features, legislation and methods of control. There are many illustrations, a number being in colour.

The work is concerned primarily with weed problems of agricultural and pastoral areas of New South Wales but a number of the species dealt with also occur in Western Australia. Control measures, including cultural, chemical, ecological and biological, are reviewed in general terms.

Although not dealing specifically with some of our local weed problems, it is a very useful reference book for both farmers and students in Western Australia. Published by the Government Printer, Sydney, it is available from the Department of Agriculture, Sydney, N.S.W., at £2 2s. (plus 2s. 5d. postage).



DISEASES of GOATS

By J. SHILKIN, B.V.Sc., Assistant Chief Veterinary Surgeon

MANY of the diseases of goats are common to sheep and cattle, and, as in these species, correct feeding, hygiene and general care and management will assist in the avoidance of serious ailments. In this article an attempt will be made to advise goat-owners on the diagnosis of the more common ailments, and suggestions as to treatment will be offered where possible. It should be appreciated however that where veterinary assistance is obtainable it is preferable to first-aid treatment. A qualified veterinarian has access to newer and more efficient methods of treatment than are available to the layman.

An outline of sound stock-husbandry measures for goat-keepers has already been given in a previous article in this Journal. The risk of losing valuable animals can be lessened by following the suggestions incorporated in that article; by the avoidance of over stocking; the destruction of harmful weeds; the removal of loose wire and other hazards, as well as by cautious grazing on green feed and discriminating use of concentrates.

MASTITIS

While mastitis may not be the cause of many deaths among milking does, it frequently results in permanent losses in production due to the formation of fibrous tissue in the udder. As with cattle, mastitis may occur in two main forms—either acute or chronic—depending usually on the type of infection which is responsible.

Acute mastitis usually occurs soon after kidding but occasionally appears later in the lactation period, particularly where hygiene is poor. It is characterised by a hot, tense, painful swelling of one or both sides of the udder. The affected quarter or quarters are hard to milk, and the secretions may be watery or bloodstained.

Chronic mastitis may occur at any time during the lactation period and may also be the outcome of a previous acute attack. In some cases the milk may appear perfectly normal. Where it is abnormal it may vary from the presence of a few clots to a curdy, stringy, slimy or watery appearance. At times the teat canal may be found blocked at each milking. Deep-seated ball-like lumps high up in the gland are not uncommon. These indurations, as they are called, are due to deposits of fibrous tissue which replace secreting tissue, and may permanently lower the milk production of an affected quarter.

Treatment.—The use of penicillin suspension put into tubes as prepared for the

treatment of mastitis in cows is most satisfactory. The injection of one tube of at least 25,000 units into the empty quarter at 24-hour intervals for three days is likely to be successful in acute cases. Similar treatment is suggested in chronic cases but may not be so successful.

Where there is considerable pain and swelling in the acute form, hot fomentations and frequent stripping, combined with the use of a stimulating liniment such as eucalyptus liniment may help to alleviate the pain.

Eucalyptus liniment consists of eight parts of soft soap; two parts of eucalyptus oil; eight parts of water. It should be applied freely and the parts thoroughly massaged.

Does affected with mastitis should always be milked after the healthy animals as the disease may be transferred on the hands of the milker. The milk from the affected quarters should be directed into a tin containing antiseptic and then destroyed.

MILK FEVER

This condition is most likely to occur in heavy milkers at their second, third or fourth kiddings. It is generally seen within two or three days after kidding but may occur just before, or up to several months after, kidding.

The actual cause of the disease is unknown but it is generally thought to be due to an upset of the parathyroid gland which in turn affects the level of calcium in the bloodstream so that there is a sudden deficiency of this mineral.

Symptoms.—The earliest signs of milk fever are loss of appetite and an unsteady gait but these are often overlooked and the animal is found to be recumbent and in a partial or complete coma. The doe may remain in this comatose state and eventually die without regaining consciousness if treatment is not applied.

Treatment.—Calcium borogluconate is the standard treatment for this condition. One ounce of calcium borogluconate should be dissolved in four ounces of boiling water which should then be cooled to blood heat. The solution can then be injected subcutaneously (under the skin) into three or four sites in the loose skin of the neck and behind the shoulder. As irritation and swelling of these injection sites may occur, an intravenous injection is preferable but this usually requires the services of a veterinary surgeon.

In most cases the animals regain their feet fairly quickly after treatment, but should not be milked for 24 hours and then only a small quantity of milk should be withdrawn, increasing the quantities over the next two or three days until normal milking is resumed.

Fig. 1.—A healthy goat should be smart and alert in appearance

HOVEN OR BLOAT

The cause of this condition is not fully understood. It usually occurs when goats are running on succulent green feed, especially lucerne or clover, but cases have also been seen on dry feed.

Symptoms.—Rumination is suspended, respiration becomes difficult and the expression of the animal is anxious. The left flank becomes markedly distended with gas. Death may occur from respiratory failure, caused by the pressure of the gas on the heart and lungs.

Treatment.—Pull the tongue as far forward as possible to induce the belching of gas, or pass a narrow rubber tube down the gullet. Four ounces of raw linseed oil plus one teaspoonful of turpentine may be given.

Where the condition is severe, veterinary assistance should be obtained if possible.

LAMINITIS OR FOUNDER

This is usually an acute systemic condition in which lameness is the most marked

symptom. Laminitis may be caused by excessive feeding on wheat or wheat products, travelling on hard roads with badly-trimmed feet and by infection with bacteria.

Symptoms.—Acute lameness is always present. The animal refuses to walk and often progresses on the knees. The feet are hot and tender and there is usually loss of appetite.

Treatment.—Where possible, and where the animal will eat, green feed should replace concentrate feeding. A drench of one or two ounces of raw linseed oil may be given daily and hot bran poultices containing a little raw linseed oil should be applied to the feet and bandaged in place. As an alternative to the poulticing, allowing the animal to stand in a tin of hot water for about 20 minutes two or three times a day may be helpful.

However, treatment with one of the newer antihistamine drugs which are available to veterinary surgeons, may reduce the condition much more quickly.

RETAINED AFTERBIRTH

Retention of portion of the afterbirth is not uncommon in does which have had a difficult kidding, especially where assistance has been given. After three or four days, the opening into the womb is closed tightly and any portions of afterbirth retained commence to putrefy, often resulting in an infection of the womb (Metritis).

Symptoms.—There is usually a chocolate-coloured, gelatinous discharge from the vagina which soils the tail and surrounding areas. Appetite becomes poor, milk yield drops and the doe loses condition.

Treatment.—Early treatment of this condition is important as blood poisoning (Septicaemia) may develop, and this is usually fatal. Veterinary attention is desirable in this condition but in the meantime, the vagina may be washed out with a 2 per cent. Dettol solution and the discharge kept off the tail and hindquarters.

Fig. 2.—The dentition of the goat is similar to that of the sheep. In the second year, the two central permanent incisors appear with two more each succeeding year. Eight permanent teeth are seen in the fifth year when the animal is "full-mouthed"

IMPACTION AND CONSTIPATION

These complaints are seen mostly in older animals which are overfed and under-exercised. Dry, hard, or fibrous feed and lack of green feed are commonly responsible for impaction and constipation.

Symptoms.—The animal ceases to chew its cud, loses its appetite and becomes lethargic and dull. There may be a tendency to bloating.

Treatment.—Give five or six ounces of raw linseed oil or paraffin oil plus an enema of about one quart of warm soapy water. When the animal will eat, supply young succulent green feed wherever possible.

Where veterinary assistance is not obtainable the subcutaneous injection of sodium sulphamezathine 33⅓ per cent. solution would be of value in overcoming any infection produced by the retention of the membranes. This is injected in a dose rate of 15 c.c. per 100 lb. body weight on the first day and 10 c.c. per 100 lb. body weight once daily for the next four or five days.

ENTEROTOXAEMIA

Enterotoxaemia is mainly an acute infectious disease caused by the organism *Clostridium welchii*, Type D, which is also responsible for the enterotoxaemia or

"pulpy kidney" in sheep. The organisms are normal inhabitants of the small intestine, but under favourable conditions they may produce a powerful toxin. The subsequent absorption of this toxin through the bowel wall generally produces a fatal toxaemia.

Goats of all ages may be affected, but it is probably more common in those over six months old, and animals in good condition are the most susceptible.

Alteration of the physical state of the bowels, such as may occur with a suudden change of feed, or when plentiful supplies of lush feed enable the animals to eat their fill without taking adequate exercise often results in the occurrence of the disease.

Symptoms.—There are two well-defined forms—acute and sub-acute and possibly a third, a chronic form.

In the **acute form**, the most noticeable symptoms are a sudden loss of appetite, severe watery diarrhoea which may be blood-stained, marked abdominal pain, violent movements and screams of pain followed by coma and death. The temperature may be high and the respiration accelerated and death usually occurs within several hours, or up to 36 hours after the appearance of symptoms.

In milking animals, there is a sudden drop in milk production at the milking prior to the onset of symptoms.

The **subacute form** is characterised by a loss of appetite and softening of the droppings which rapidly become diarrhoeic, and may contain some blood. The animal is dull and listless, but the severe abdominal pain seen in the acute form is absent. There is, in this form too, a sudden drop in production in milking animals and the symptoms may persist for several days before death occurs.

There is some doubt about a chronic form, but there have been reports of a condition in which anaemia and wasting occurred over a period of months and which was attributed to *C. welchii* infection.

Post-mortem Symptoms.—As with sheep, post-mortem findings are not very evident, particularly if the examination is carried out soon after death, but small haemorrhages of the heart muscle and sac and inflammation of the fourth stomach and small intestine are usually present.

Diagnosis.—A presumptive diagnosis, particularly of the acute form, can usually be made on the symptoms, but an accurate diagnosis requires laboratory examination of small bowel contents or faeces.

Treatment.—Treatment with sulphamezathine by mouth may be effective provided the initial dosage is high and subsequent doses maintained at proper intervals for a sufficient length of time. For this purpose, 2 grammes (4 tablets) for each 20 lb. weight given as the initial dose followed by 1 gramme (2 tablets) for each 20 lb. weight at 12 hourly intervals until the diarrhoea ceases, would be a suitable dose rate.

Pulpy Kidney Antitoxin may also be used for treatment, and for this purpose the injection should be carried out as early as possible. At least 20 ccs. should be injected but up to 100 ccs. may be used if thought necessary.

The combination of sulphamezathine and antitoxin treatment is likely to be more successful than either alone, but as will be mentioned later, the use of antitoxin has some dangers, particularly with the Saanen breed.

Prevention.—As it seems that a sudden change to succulent feed is an important factor in "triggering off" the infection, every care should be taken to accustom the animals to new fodder gradually.

When cases occur, it may be possible to protect the remainder with antitoxin which confers immunity for two or three weeks. However, antitoxin is comparatively expensive, and as there are some special dangers in the use of antitoxin, it is probable that preventive vaccination designed to maintain a high level of immunity throughout the year is the more practical procedure. This is particularly important in goats in which the seasonal incidence seen in sheep does not necessarily occur.

For this purpose a special vaccine for goats has been prepared by the Commonwealth Serum Laboratories, and this is given by subcutaneous injection in a dose of 1 cc. followed successively at intervals of one week, by doses of 2 ccs., 3 ccs., and 4 ccs. A further dose, also at an interval of one week may be given with advantage.

In order to maintain the level of immunity, re-vaccination at intervals of approximately six months is advisable.

In the case of the white Saanen breed particularly, there appears to be an idiosyncrasy to the injection of Pulpy Kidney sera and vaccines—and possibly other vaccines—and collapse, abortion and deaths are possible if care is not taken. This condition is known as anaphylatic shock and may occur where an animal is first sensitised with a foreign protein and then injected ten or more days later with further amounts of the protein. For this reason, the special vaccine for goats has been prepared in such a manner that the foreign protein it contains has been reduced to a minimum and vaccination is carried out with small doses at intervals of one week. It is important to remember that these intervals should not exceed one week.

For chapped and cracked teats the following ointment is useful:—

Lanolin 1 oz.
Vaseline 1 oz.
Salicylic Acid ½ oz.

This should be applied twice daily after milking. A 2 per cent. acriflavine emulsion used in the same way is also useful.

GOAT POX

This is due to a virus, very similar to the virus causing cow pox. Goats of all ages are susceptible but older animals are more commonly affected. The virus is present in the crusts covering the sores and infection spreads by direct or indirect contact. The usual course of the diseases is about three weeks and the incubation period from one or two days to a week.

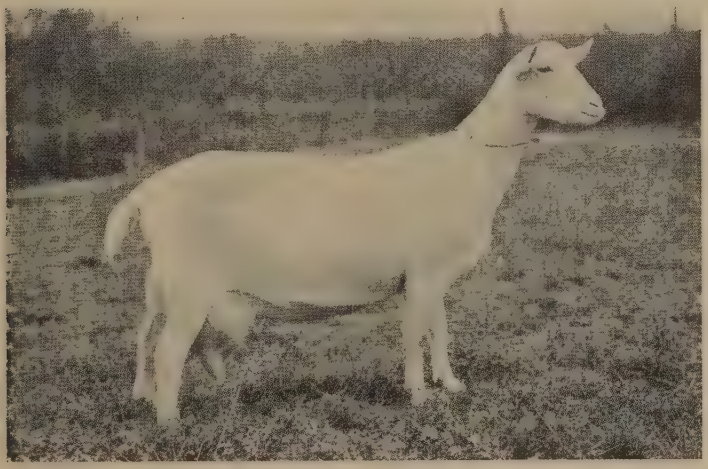


Fig. 3.—Saanen goats in particular are often adversely affected by injections of Pulpy Kidney Vaccine as prepared for sheep. Specially-prepared goat vaccine should always be used

SORE TEATS

Chapped or cracked teats may occur when the teats are not dried after milking particularly in cold weather. Teats may be also torn by barbed wire, thorns, etc.

Treatment.—Small wounds may be treated by first dressing with an antiseptic solution such as Dettol, drying, and then binding the teat with adhesive plaster to draw the edges together. Instead of hand milking it is preferable to allow the kid to suck for a few days.

For large lacerated wounds where suturing may be necessary, treatment by a veterinarian is desirable.

Symptoms.—It is generally a fairly mild condition but loss of appetite and fever may occur. Small reddened areas first appear on the teats and udder. These later become raised as watery blisters and progress to pus-filled pox sores. After a few days these are replaced by scabs, which finally fall off leaving white sunken areas.

Goat pox is transmissible to humans and usually affects the hands. One attack in the goat produces a lifelong immunity against further attacks.

Treatment.—Affected animals should be separated and, if in milk, should be milked last. The milk is considered unsafe for

several days before and after the vesicle formation. Salicylic acid ointment as recommended for sore teats should be applied twice daily.

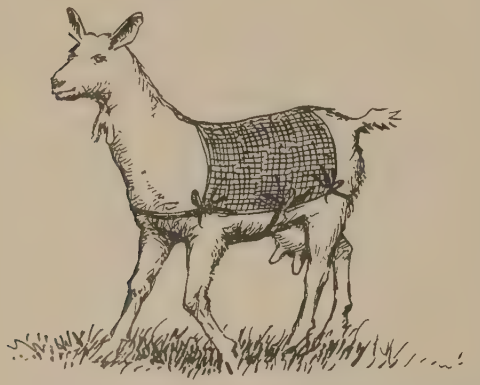


Fig. 4.—Sick goats will sometimes benefit by being rugged if the weather is cold. A cornsack will often serve the purpose

CYSTITIS (INFLAMMATION OF THE BLADDER)

Cystitis is a condition which occasionally occurs after kidding but may occur at other periods.

Symptoms.—The main symptom is constant straining, with the passage of small quantities of urine. Scalding of the skin surrounding the breech occurs, and the urine is often cloudy and may contain pus or bloods clots.

Treatment.—If veterinary assistance is not obtainable, half a teaspoonful of bicarbonate of soda in barley water and 1 oz. raw linseed oil daily may be administered as a drench, or two Rexamene tablets (5 grain) may be given twice daily for five days.

OPTHALMIA (PINK EYE)

This condition is caused by minute organisms known as *Rickettsias*. It is a contagious disease spread by flies and by contact with the discharges from affected eyes.

Symptoms.—A watery discharge is usually the first sign of this disease. The mucous membranes of the eye become intensely congested and, because the cornea of the eye is infected, there is usually a bluish-white film over the eyeball. In severe cases the eyeball may rupture. Depending, too, on the severity of the condition and the success of any treatment, there may be temporary or permanent blindness. Milk production drops and there may be a rapid loss in the condition of the animal.

It is most likely to occur in the warmer months when flies are prevalent.

Treatment.—The most effective treatment is chloromycetin eye ointment squeezed into the eye night and morning. If the treatment is commenced in the early stages, one day's treatment may suffice, but more severe cases may require treatment for three or four days.

Penicillin eye ointment and sulphacetamide eye ointment are also satisfactory preparations to use for treatment.

Where none of the above preparations is available, bathe the eyes twice daily in a solution of one teaspoonful of common salt to one pint of water and then place a few drops of 10 per cent. argyrol in each eye.

RINGWORM

This condition is caused by a fungus which affects the hair fibres and follicles causing the hair to fall out, leaving circular bare areas. It is usually seen in badly-nourished animals and is readily transmitted by contact to other goats.

Treatment.—The affected areas should be thoroughly washed with warm water to which has been added one tablespoonful of washing soda to every gallon of water. When dry, apply a 2 per cent. solution of sodium hyposulphite (photographic "hypo") or ordinary tincture of iodine to the bare areas. Treatment should be continued until the infection appears to have been overcome, when short new hairs may be seen on the bare patches.

WORM INFESTATION

Heavy worm infestation may be responsible for serious losses of condition and lowered production. As with sheep, it is the young animals that are most likely to suffer heavily from internal parasites but certain types of worms, particularly the large stomach worms, may cause mortality in older animals.

Symptoms.—The most common symptom is a progressive loss of condition, but this symptom may be overlooked if animals are on a poor diet. In severely-affected goats, loss of condition may progress until a state of emaciation is reached. While diarrhoea is frequently present it does not necessarily appear as a constant symptom. The type of worm present generally determines the presence of otherwise of diarrhoea. There is usually a progressive reduction in milk supply, gradual loss of appetite and harsh staring coat. In the case of stomach worm infestation there may be a swelling under the jaw—the so-called 'bottle jaw" —and a severe anaemia.

Treatment.—Before treatment is carried out, veterinary examination of the droppings in order to determine the type and extent of infestation is desirable.

For most of the stomach and intestinal parasites which are likely to be encountered, phenothiazine is the most efficient drug to use. This is sold under various proprietary names and can usually be obtained in 1 lb. and 7 lb. packets. The phenothiazine is mixed with water to form a suspension and directions regarding mixing are supplied with the preparation. The suspension is given as a drench in the following dose rates:—

Adults—1½ oz. powder.

12-18 months—1 oz.

8-12 months—¾ oz.

3-8 months—½ oz.

Does should not be treated within four weeks of kidding, but should be treated about two weeks after kidding. Kids should be treated when they reach three months and all doses should be repeated after an interval of a fortnight. Following dosing with phenothiazine there may be a red pigmentation of the skin in white goats after two or three days. This pigmentation is not harmful but it may persist for some weeks.

Prevention.—Prevention of worm infestation is far preferable to treatment. Overstocking of pastures is dangerous and the avoidance of moist damp areas is most important. If this cannot be carried out animals should be treated with phenothiazine every six to eight weeks.

Good feeding helps to control the ill effects of worm infestation.

DIARRHOEA

In adult goats this trouble is likely to be due to worms, ingestion of certain weeds or too rapid a change from one feed to another. In kids it may be due to worms or careless feeding.

Worms are dealt with elsewhere in this article. When diarrhoea is due to other causes, removal of the cause and correct attention to hygiene and good animal husbandry practices are important. Persistent diarrhoea is most exhausting to the animal, resulting in considerable loss of condition and should be treated promptly.

Treatment.—A mixture of bicarbonate of soda, charcoal, prepared chalk, and ginger (four ounces of each), is useful. This is given in doses of one tablespoonful twice daily mixed with a little water. Where there appears to be considerable pain, 10 drops of chlorodyne may be added.

Where scouring persists, veterinary attention should be obtained if possible. Sulphaguanadine tablets (0.5 grams) are often effective in the treatment of diarrhoea, the dose being six tablets initially, followed by three every three hours.

LICE

Goats may be infested with two types of lice—biting and sucking types.

Infestation can occur at all ages, but kids are the most susceptible. In adult animals it is usually the weak and unthrifty that suffer a heavy infestation.

Lousy goats have a rough appearance due to constant rubbing against projecting objects in an attempt to relieve the irritation.

The eggs are laid in a sticky secretion which mats the hair together. Hatching occurs in one to two weeks and the adult stage is reached in a further three to five weeks. Although it is normal for lice to spend the whole of their lives on the goat, under favourable conditions they may survive off the host for up to 18 days, so that clean animals may become infested through indirect contact. As with lice in other animals, infestation is usually heaviest in the autumn and winter months.

Treatment.—Sucking lice are more difficult to kill than the biting lice. DDT and

Gammexane are both effective against these parasites and these preparations have a residual value which prevents re-infestation for some days following treatment.

DDT can be used as a spray (1 per cent.) or as a powder (10 per cent.). Particular care should be paid to the flank and neck regions.

Gammexane emulsion or suspension as prepared for the treatment of sheep is also very effective.

Furrowing Helps to Reclaim Salt Land

This photograph shows the effect derived from furrowing badly salt-affected land in the eastern wheatbelt in aiding the re-establishment of plant growth. The plants in the background are bluebush plants. By furrowing the bare salty soil and excluding stock young bluebush plants and barley grass are establishing in the roughened soil. Bluebush seed spreads rapidly by wind and this area with no work other than grazing protection and furrowing will quickly become a complete stand of bluebush, such as is shown in the background.

Making YOUR OWN BEEHIVES

By R. S. COLEMAN, Officer-in-Charge, Apiculture

THE publication of this article runs counter to my own principles to some extent as I have long maintained that most beekeepers will find it cheaper in the long run to purchase factory-made hives and frames. I realise, however, that many apiarists possess both the skill and equipment to make hive-bodies, and that some at least can occupy slack periods profitably in this manner.

I would not advise anybody to make his own frames unless he has a very well-equipped machine-shop, but I realise that there are a number of reasons why hive-bodies could be profitably constructed by the bee-keeper himself.

To the beginner in beekeeping I would strongly urge standardisation so that all his hive materials are interchangeable whether they are home-made or purchased ready for assembly. Decide on either eight-frame or ten-frame hives—don't have a hotch-potch of sizes.

Have you ever considered making your own bee-hives? Probably you have, but dismissed the idea because you imagined that it would need expensive wood-working equipment, or because you doubted whether suitable timber was available.

The equipment need not be costly. A good power saw with a rise and fall table is of course a necessity if you intend to tackle the work on a fairly large scale, but most of the other equipment may be home-made or could be constructed fairly cheaply by tradesmen.

The timber problem is as old as the Australian beekeeping industry but early beekeepers managed to overcome it, and you have far better opportunities than they had.

The scarcity of Australian softwoods compelled the pioneer bee-keepers to depend very largely upon that popular container—the imported kerosene or petrol case, of the pre-bowser days. The cases and the tins they contained—two tins to the case—might almost be described as having laid the foundations of Australian civilisation.

The hives in many sizeable apiaries were entirely constructed from petrol-cases in the early years of this century and the cases were widely used for fruit-packing—in fact the size of the modern beehive and the "dump" fruit-case were largely influenced by the ubiquitous petrol or kerosene case.

Many an outback home was almost entirely equipped with petrol-case furniture in the form of chairs, meat-safes, cupboards, desks, book-cases, etc., and the tins were used as honey containers, buckets, wash-bowls, dish-pans, cooking utensils—to name but a few of their varied roles.

Later, a number of hives were made from suitable Australian timbers but far more were made from imported softwoods such as red pine, yellow pine, oregon and other materials from across the Pacific.

Here in Western Australia we still have to depend largely on imported timber for beehive construction. We have fairly extensive plantations of softwoods, but in the main these are still too young to provide large quantities of suitable beehive timber and we have to look to Malaya, Borneo and to South Australia whose pine plantations are older than ours.

Most of our local pine is from two introduced species, the Monteroy pine *(Pinus radiata)* and the Maritime pine *(Pinus pinaster)*.

Pinus radiata was formerly known as *Pinus insignis* and, in the days when most of the local supplies were from thinnings and immature trees, some wag rechristened the timber "Pinus intwistis" because it had a habit of warping badly.

Suitable timber is usually available in 6 in. x 1 in. and 4 in. x 1 in. planks. Occasionally 10 in. x 1 in. planks may be obtained, but trees of this size are usually reserved as "peeler" logs for our young and vigorous plywood industry.

The height of a finished beehive box is 9½ in. with a length of 20 in. and a width of either 14 in. or 16 in. according to whether we are making eight-frame or ten-frame hives. Timber thickness should be ⅞ in. giving the hive-box the inside measurements of 18¼ in. x 12¼ in. for the eight-frame hive or 18¼ in. x 14¼ in. for the ten-frame size.

PREPARING THE TIMBER

Few bee-keepers have the equipment and space required to treat unseasoned rough-sawn planks, and it is better to buy dry timber dressed to ⅞ in. When 1 in. thick planks are dressed, the timber usually finishes nearer 13/16 in. thick and unless we can ensure that the rough-sawn material is somewhat thicker than 1 in. we may have to make do with the 13/16 in. timber. In this case it will be necessary to make the dovetails 13/16 in. in depth instead of ⅞ in.

Check the plank widths also, if using the 6 in. x 4 in. material. It may be necessary to use 6 in. and 5 in. planks to ensure that our finished boxes are 9½ in. high.

The best way to handle the planks is to glue them together using a good quality waterproof glue such as marine glue or one of the cold-water casein compounds.

Make a frame of 4 in. x 2 in. timber, similar to the floor-joists of a house. Nail blocks of waste timber to the joists to serve as stops and put your plank against them. The modern glues, used properly, are stronger than the timber but as an extra precaution I would suggest that you drive a few 2¼ in. hive nails into the edge of the plank leaving about half the length of the nails protruding. Cut off the heads with pincers or wire-cutters, apply the glue to the edges of both planks and force them together with floor cramps. The nails act as dowels and keep the planks in position.

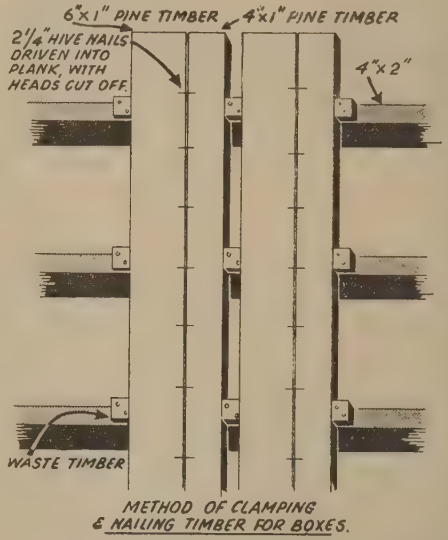

6"x1" PINE TIMBER
4"x1" PINE TIMBER
2¼" HIVE NAILS DRIVEN INTO PLANK, WITH HEADS CUT OFF
4"x2"
WASTE TIMBER
METHOD OF CLAMPING & NAILING TIMBER FOR BOXES.

Fig. 1—Method of glueing planks for hive bodies

N.B.—Make certain that the nails are not placed where the planks will be sawn —and, in case you are forgetful, mark their positions with heavy pencil marks.

When the two edges are forced together, nail waste timber to the joists to hold the planks in position and proceed with the glueing of the next pair of boards.

To be on the safe side, leave the planks in position under tension for double the time recommended by the glue manufacturers.

CUTTING THE SIDES

When the glue has set and the composite planks are removed from the joists by pulling the nails out of the waste timber, the next task is to trim them to an exact 9½ in. width, and then to cut your boards to the required lengths—20 in. for the sides and 14 in. or 16 in. for the ends.

Simple guides on the saw-bench will ensure accuracy in cutting.

N.B.—If the timber is knotty, make sure that your saw-cuts do not go through the knots as knots will interfere with the dovetailing of the ends.

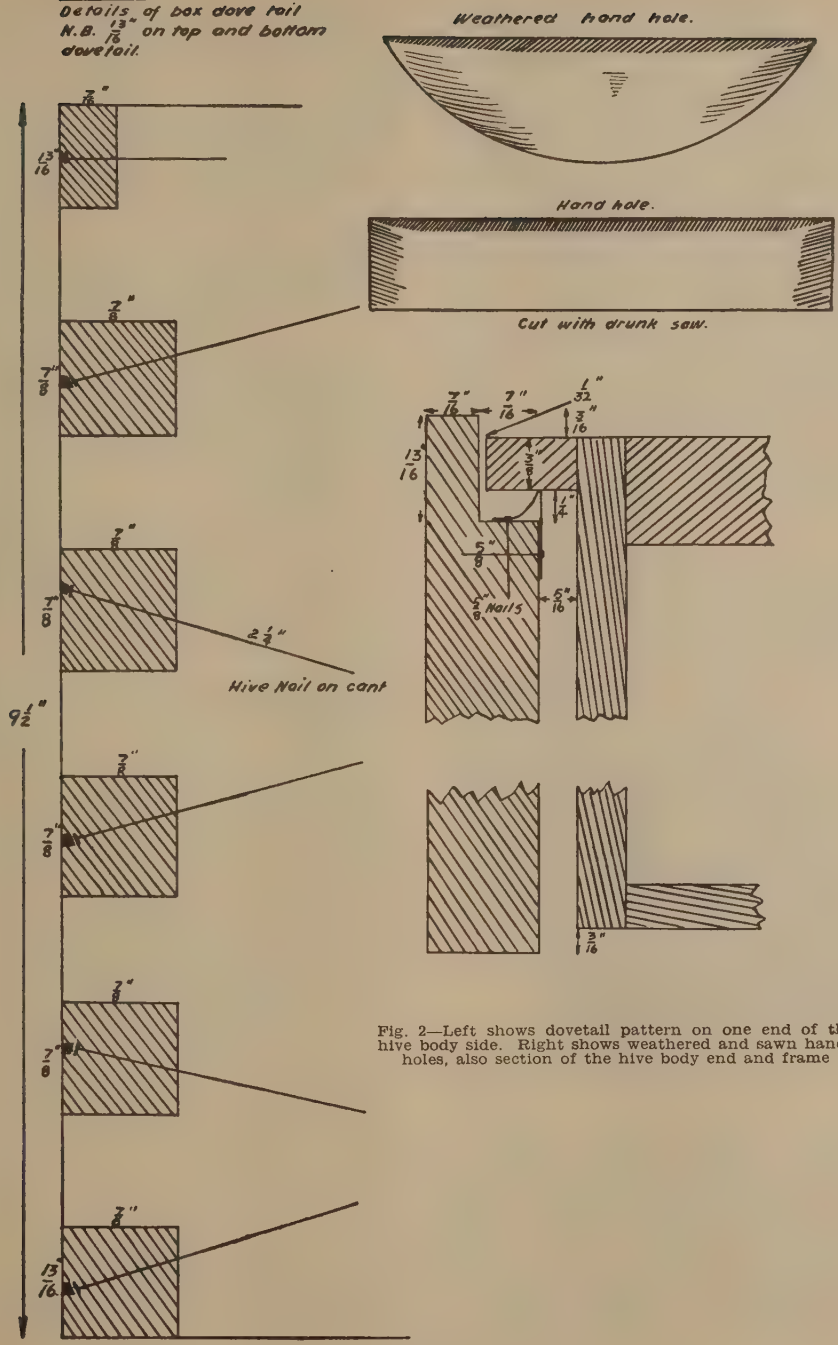


Fig. 2—Left shows dovetail pattern on one end of the hive body side. Right shows weathered and sawn hand-holes, also section of the hive body end and frame

DOVETAILING

A glance at Fig. 2, which represents one end of the side of our box shows that the "sockets" and "pins" of the dovetails—except those at the top and bottom—are exactly $\frac{7}{8}$ in. square, which measurement is the thickness of our box timber.

The top socket or cutaway portion is only 13/16 in. x 7/16 in. Fig. 2 also shows the end of the box and one of the frames and will explain the reason for this being only half the horizontal depth of the other sockets. It takes that portion of the box end which is rabbeted to take the metal slide which in turn supports the lugs of the frames.

The bottom socket has the full $\frac{7}{8}$ in. horizontal depth but like the top socket, is only 13/16 in. deep vertically. The reason for the two 13/16 in. sockets is so that the box is only $9\frac{1}{2}$ in. deep and not $9\frac{5}{8}$ in. as it would be if all sockets were $\frac{7}{8}$ in.

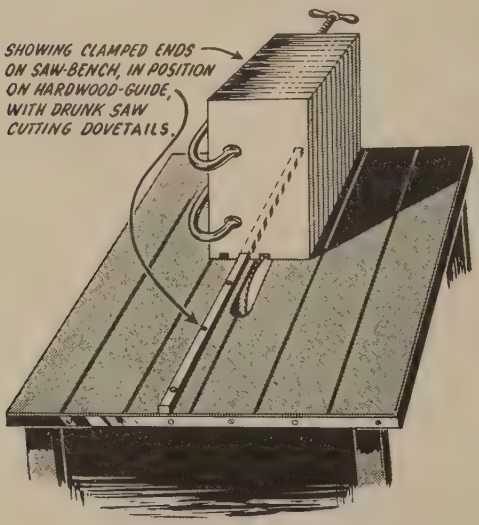


Fig. 3—Cutting dovetails with drunk saw and hardwood jig

Here again a few words of explanation are needed. Another glance at Fig. 2 shows that when the frames are in position there is a 3/16 in. space top and bottom. The frames are $9\frac{1}{8}$ in. deep overall, which means that there is a 3/16 in. space between the tops of the frames and the lid or hive-cover at the top and double this space ($\frac{3}{8}$ in.) between the bottoms of the frames and the tops of the frames in the box below, if two or more decks of frames are being used.

These spaces are the minimum and maximum allowances for "bee-space." A space of less than 3/16 in. does not allow the bees free access to keep the frames free from bee moth and other pests. Bees also tend to seal off such small spaces with the gummy substance known as propolis.

Spaces in excess of $\frac{3}{8}$ in. are liable to be filled in with "burr comb" as bees have fixed ideas regarding empty spaces in the hive.

Cutting the Dovetails

Having established our sizes, let us now concentrate on cutting the dovetails. We will need a circular saw with a rise and fall table and our saw must be a "drunk saw" capable of being set at an oblique angle to the saw-spindle by means of special washers or collars. Our saw is "drunked" so that it cuts exactly $\frac{7}{8}$ in. wide, and the table is adjusted so that the saw protrudes just $\frac{7}{8}$ in. above the surface. In other words it is now set to cut an exact square for the dovetail socket.

A simple jig or guide is a piece of dressed timber measuring a shaving under $\frac{7}{8}$ in. x 7/16 in. and long enough to go across the saw-bench from front to rear parallel with the saw-blade.

If all our sockets and pins were to be $\frac{7}{8}$ in. it would only be necessary to clamp or screw the guide exactly $\frac{7}{8}$ in. from the saw's farthest left-hand cut, and then use it as a fence or guide. The hive-box sides would be stood on end and run over the saw which would remove a $\frac{7}{8}$ in. square. The cut-out square could then be fitted over the guide and another run over the saw would cut the next socket and so on.

Being a perfectionist, however, I suggest that you make a second jig to take care of those 13/16 in. sockets.

Obtain a piece of 3 in. x 2 in. Oregon or other suitable timber long enough to go across the saw-bench from front to rear. Dress it down so that it measures exactly 2-11/16 in. in width—the height can remain at 2 in. or thereabouts.

With your first jig or guide in position just $\frac{7}{8}$ in. from the left-hand cut of the drunk saw, lift the rise and fall saw-bench table so that the saw cuts 7/16 in. deep. Press the new piece of timber hard up

against the guide and run it slowly over the saw which will cut a groove measuring ⅞ in. wide by 7/16 in. deep.

To make the next cut, fit this groove over the guide and run the timber over the saw once again, but before doing so, drop the table so that the saw cuts ⅞ in. deep instead of 7/16 in. This allows the saw to remove 1/16 of an inch to a depth of ⅞ in. as shown in Fig. 4.

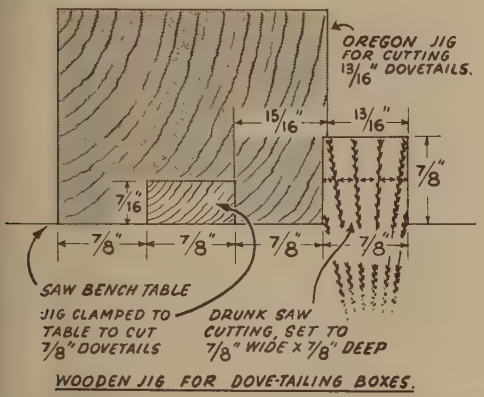


Fig. 4—Oregon jig for cutting the 13/16 in. sockets

With this second jig clamped in position over the first, the saw can only cut 13/16 in. instead of 14/16 in. (⅞ in.).

It will be found advisable to clamp about ten of the box sides together between two pieces of waste timber—the waste timber being to ensure that there is no splintering of the bee-hive material where the saw

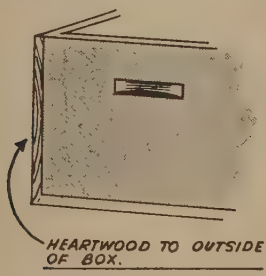


Fig. 5—Cut hand-holes on the heartwood side of the box

enters and leaves the timber. The ten sides must be clamped to form a solid block with the ends perfectly square. The "nailing jig" shown in Fig. 6 will help to achieve this, as this is welded to form a perfect right angle.

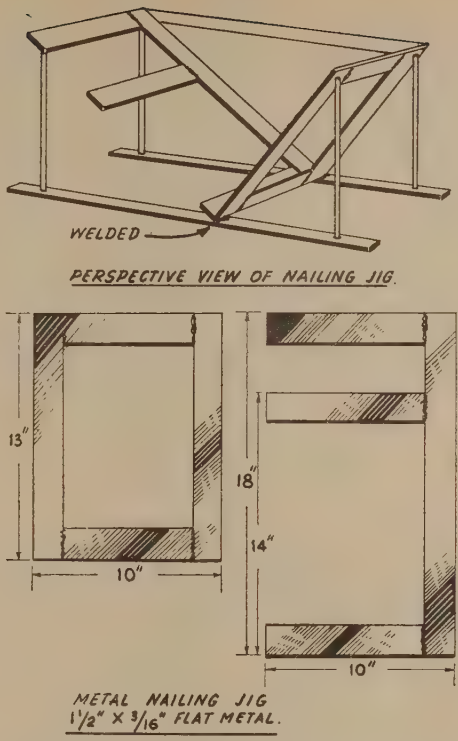
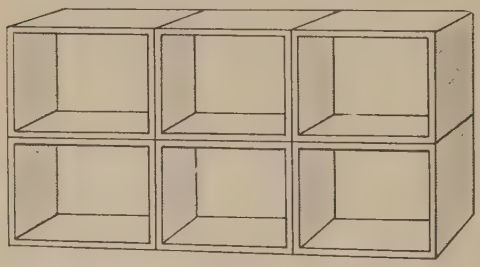


Fig. 6—Nailing jig

Dovetailing the Sides

With your ten hive-body sides—plus the waste strips—clamped together by large G-cramps or similar gadgets, stand the block of sides on end and run them over the saw, using your Oregon jig as a fence. This will cut the bottom dovetail sockets—presuming that your saw is cutting ⅞ in. deep. Treat any succeeding bundles of sides in the same manner, then set saw to cut half the depth (7/16 in.) and cut the top sockets which take the rabbeted portion of the side.

When these are completed, drop the saw-bench table down to cut $\frac{7}{8}$ in. deep again, remove the Oregon jig and use the first jig or fence to complete the $\frac{7}{8}$ in. square sockets.

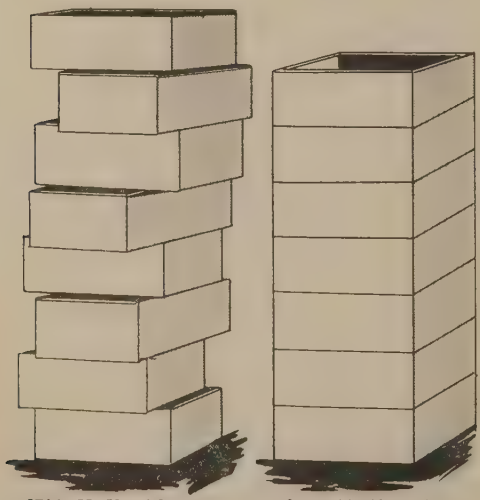


STACKED FOR EASY INSIDE PAINTING.

Fig. 7—"Pigeon-hole" stacking facilitates painting of the inside surfaces

Dovetailing the Ends

The ends are dovetailed in a similar manner to the sides except that the position of the "sockets" and "pins" is reversed, the top and bottom 13/16 in. portions being pins and not sockets. You could move your $\frac{7}{8}$ in. x 7/16 in. jig, a 1/16 of an inch closer to the saw to cut these top and bottom pins, and you could also cut the rabbets with the jig in this position and the saw set to cut 7/16 in. deep.



STACKED FOR DRYING FROM DIPPING BATH.

STACKED FOR EASY OUTSIDE PAINTING.

Fig. 8—"Chimney" and "criss-cross" stacking for painting and drying the outsides of the boxes

Remember to move the jig back to $\frac{7}{8}$ in. before cutting the remainder of the dovetails.

Handholes

Both the sides and the ends of the factory-made hive-bodies are equipped with recessed hand-holes for easier lifting. The factory-made boxes usually have "weathered" hand-holes made with a special cutter but if the home hive-maker does not wish to incur this added expense, a satisfactory hand-hole can be made by lowering the sides and ends separately on to a drunk saw set to to cut $\frac{7}{8}$ in. wide and 7/16 in. deep. Suitable guide fences and stops are attached to the saw-bench to ensure that the hand-holes are scooped out in the same pre-determined position on each piece of timber.

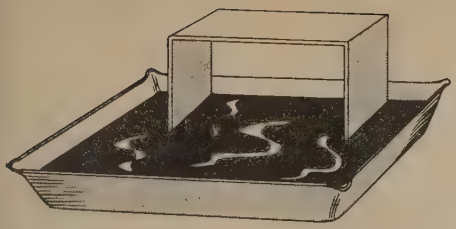
A point worth mentioning in connection with the hand-holes is that they should be cut on the heartwood or inside portion of the timber. The rings on the ends of the timber will indicate the heartwood sides. The hand-hole should be on the inside of the curves as shown in Fig. 5. The wood on the bark side of the tree is less dense and shrinks more than that on the inner portion. With the heartwood on the outside, there is less tendency for the shrinkage to lift the outer edges where nailing is less secure.

ASSEMBLING BOXES

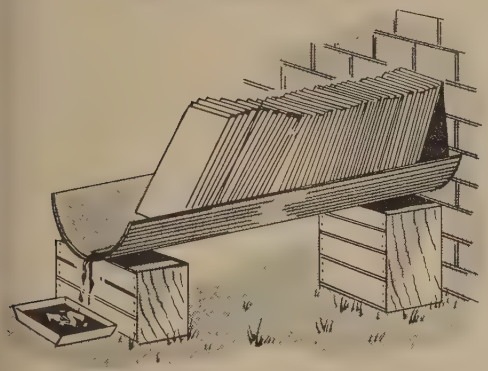
With the ends and sides completed, the next task is to assemble the boxes. Whether home-made or factory-made, the boxes represent a sizeable outlay, so it is up to you to ensure that they have a long life and resist the ravages of the weather and dry rot. Careful painting and assembling can help.

Before assembling the boxes, dip the dovetailed ends in a good primer paint, or apply the paint lavishly with a brush. Red lead primer has stood the test of time and that sold by ship chandlers is the best I have yet encountered.

Assemble the boxes while the paint is still wet as this forms a good seal. The nailing jig shown in Fig. 4 is a great help at this stage as it holds the box in place and ensures that all corners are square. Drive the $2\frac{1}{4}$ in. hive nails in at an angle as shown in Fig. 1, and punch the heads well in so that the holes may be filled up



TIN BATH FOR BOX DIPPING.



ENDS STACKED FOR DRYING IN TROUGH.

Fig. 9.—Dipping and draining methods can be applied to completed boxes or to separate sides

with putty later after the priming coat is applied. The metal strips to carry the frame lugs may be attached either before or after assembling the box.

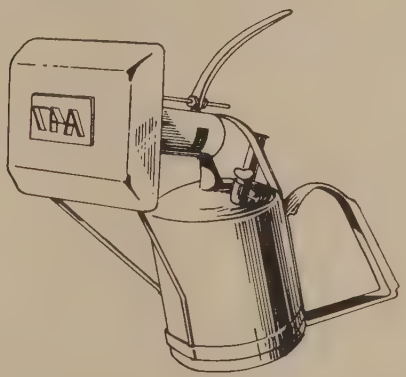
Stack your boxes in "pigeon-hole" fashion as shown in Fig. 7 to facilitate painting the insides. Use a primer, undercoat and a finishing coat on both the inside and outside of the boxes. Failure to paint the inside of the boxes allows condensation moisture to soak into the wood, lowering the temperature of the hives, causing mildew, rusting the nails, encouraging wood-rotting fungi, and incidentally adding considerably to the weight of the hives if they have to be transported.

When the inside painting is finished, stack the boxes in "chimneys" eight or ten high and proceed with the outside painting (Fig. 8). Light stone, yellow, light green or blue, silver or white are popular finishing colours. Personally I like the silver paint as this seems to give the best protection against summer heat which has a marked effect on honey production.

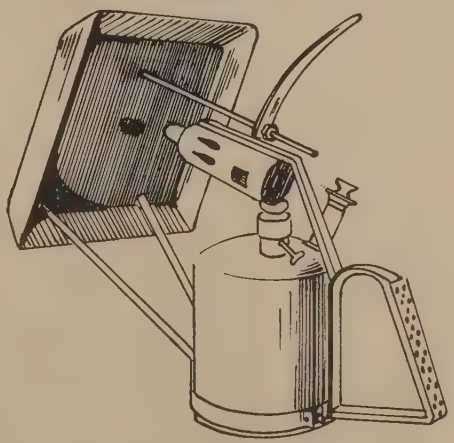
Many bee-keepers use bitumen-based aluminium paint which, being of a very thin consistency, lends itself to application by dipping the boxes in a shallow tray (Fig. 9). After dipping, the boxes are stacked in criss-cross fashion to dry. The plastic glue called Boncrete, diluted with four parts of water is another popular primer as it seals the wood very effectively.

BRANDING

The law requires that all boxes be fire-branded with the bee-keeper's registered brand on at least one surface. Most bee-keepers prefer to brand on all four sides to guard against theft. Where a number of boxes are to be branded, a branding-iron attached to a blowlamp (Fig. 10) is a good investment.



FRONT VIEW OF BRANDING IRON



REAR VIEW OF BRANDING IRON.

Fig. 10—Hive branding iron fitted to blowlamp

Honey Flora Calendar for June

COMPILED BY R. S. COLEMAN, APICULTURAL SECTION, WITH ASSISTANCE FROM THE BOTANICAL BRANCH

Common Name	Botanical Name	Where Found	Honey		Quality of Pollen	Remarks
			Quality	Quantity		
Red or Firewood Banksia	*Banksia Menziesii* R.Br.	Coastal sandplain	Good	Poor-Good (conflicting reports)	Unknown	Grows in association with other plants. Keeps brood raising going.
Acorn, Silver Orange Banksia	*B. prionotes* Lindl.	Coastal in inland sandplain areas	Poor	Poor-Good	Good	Differing views held on this Banksia; probably good producer in some areas. Its main fault is that tight cones trap bees.
Holly Leaved Banksia	*B. ilicifolia* R.Br.	Low areas but not swamp in coastal plain	Unknown	Uncertain	Good	Long flowering. Small areas only.
Fox Banksia	*B. sphaerocarpa* B.Rr.	Widespread	Poor	Poor	Unknown	Often in area where bees build up; could contribute to build up.
Silky Blood Flower	*Calothamnus sanguineus* Labill.	Widespread; seems to like rocky slopes either lime or ironstone	Dark, good quality	Excellent	Good	Flowers over a long period.
One-sided Bottlebrush	*C. quadrifidus* R.Br.	Widespread	Poor	Good	Excellent	Good producer, June, July, August. Good builder of strength.
Kerosene Bush	*Daviesia Ashbyi* B. L. Burtt.	North of Dongara	First quality	Good	Good	Found on ironstone outings and sandstone; likes clay soil and gravelly soils best; produces a fortnight after the opening rains.
	D. Fraseri R.Br.	Wagin, Narrogin main area, to Dongara and south in white gum country	Doubtful	Doubtful	Good	This plant closely resembles *D. Ashbyi* and should give similar results; no reports coming to hand.

Eggs and Bacon ...	*Daviesia juncea* Sm.	Widespread	Good	Good	Good	One of the good winter-flowering plants, flowering in June-July; a plant that holds and builds up strength of the bees.
Karri	*Eucalyptus diversicolor* F. Muell.	Southern coast; Denmark-Walpole-Albany	Choice	Excellent	Poor	Flowers through winter; bees store some honey, depending upon weather.
Lustre Leaved Mallee	*E. foecunda* Schau.	North of Dongara	Unknown	Good	Unknown	This could be a good future honey plant.
Bullich	*E. Megacarpa* F. Muell.	Associated with coastal karri	Choice	Good	Good	A good build-up for karri. Too scattered to be of much value.
	Hakea scoparia Meissn.	Midlands, Coorow-Moora	Good	Good	Good	Good flow; sensitive to frosts; the nectar worked when nectar is thick.
White Bell	*Leucopogon conostephioides* D.C.	Poor sands generally associated with Menzies Banksia	Good	Good	Good	Importance of this plant is its time of flowering, producing when there is little else. Rain does not penetrate the flower and the nectar is not diluted.

It will be seen from this list that information concerning many nectar-bearing plants is far from adequate. We would appreciate further information from beekeepers

The Veterinary Annual

☆

This is the first edition of an annual which is certain to be extremely popular with members of the veterinary profession.

It is mainly a review of recent findings in an easy-to-look-at form and is designed primarily for veterinary practitioners and field workers rather than for the veterinary specialist.

One of the difficulties of the veterinary profession particularly at the present time, is keeping up with the great volume of work on all aspects of veterinary science. The scope of the profession is continually expanding and specialisation as is the case in the medical profession, is on the increase.

The average practitioner or field worker finds that in the time available to him for reading, it is virtually impossible to keep up with the voluminous literature on all aspects of veterinary science and for this reason up-to-date reviews of this type are likely to be valuable.

In addition to the reviews of recent literature, there are special articles on current trends in veterinary work in Australia, New Zealand, U.S.A., Canada, Denmark, Sweden and Africa which are most informative.

There is also a practitioners' index of new drugs and appliances.

Regular editions of the Veterinary Annual should hold great appeal for most veterinarians but because of its type, it is not a book for the farmer or pastoralist.

("The Veterinary Annual 1959" edited by W.A. Pool M.R.C.V.S., published by John Wright & Sons Ltd., The Stonebridge Press, Bristol, England. Price in Great Britain 42s.)

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AUSTRALIAN TRACTOR TESTS

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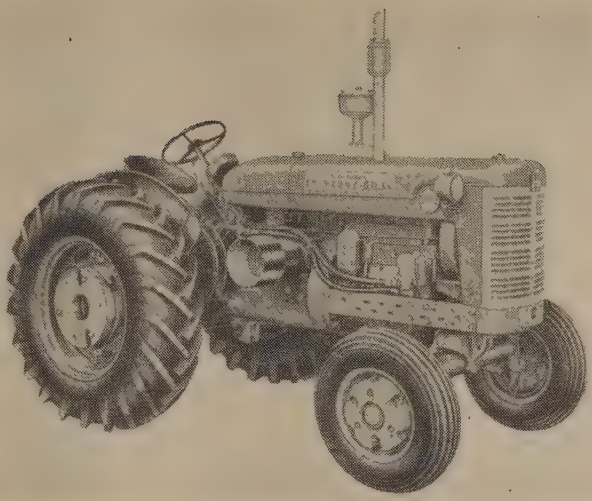


REPORT ON TEST No. 30

(Farmers' Edition)

McCORMICK INTERNATIONAL –SUPER AWD–7 (DIESEL)

(Tested for the International Harvester Co. of Australia, Geelong)

THIS Report is taken from the full Technical Report No. 30 of this test; test results are shown here in briefer form: fuller explanations are added. Values quoted may be rounded out to two instead of three significant figures; to this extent the values may differ slightly but not significantly from those shown in the Technical Report. Graphs of belt test performance, shown in the Technical Report, are not shown here. The Technical Report is not available in large numbers, but it may be seen at, and copies of this farmers' report may be had from the offices of the State Departments of Agriculture, the Bureau of Sugar Experiment Stations (Queensland), and the Commonwealth Department of Primary Industry.

1.—THE TESTS

(1) After twelve hours of running-in, two types of tests were carried out, in order to measure the performance of the engine, as measured by the power in the belt driven by the belt pulley, and the performance of the tractor as a whole, as measured by drawbar pull, tractor speed, wheel slip, and drawbar horse-power (d.b.h.p.), with the tractor running on a bitumen test track.

The main results of these tests are given in Sections 2, 3, and 4. Other measurements and observations were made of various features of the tractor; these are given in Section 5.

(2) *Fuel Settings.*—The engine of this tractor has only one fuel setting, sealed, at which all the tests were carried out.

The Australian Tractor Testing Committee is a joint body established by agreement between the Commonwealth, the States, and the University of Melbourne; under this agreement, the tests are carried out by the University of Melbourne. The address of the Tractor Testing Committee is: C/o Department of Primary Industry, 301 Flinders Lane, Melbourne.

(3) *Governor Control.*—The engine was under the control of the governor set to give full throttle, and so maximum power at rated engine speed.

(4) *Fuel.*—Distillate, Diesel Index 67, Specific Gravity 0.82; weight per Imperial gallon 8.17 lb.

(5) *Specification.*—Engine No. AD264 5265. For a brief specification of this tractor see Section 6 at the end of this report.

2. SUMMARY OF POWER OUTPUT

Table A

	At the Belt	At the Drawbar
Rated engine speed, r.p.m.	1,450	1,450
Corrected maximum power (*a*)	48·8	44·6
Rated power (*b*)	41½ (*b*1)	33½ (*b*2)

(*a*) Corrected maximum h.p. is calculated by a suitable formula from observed maximum h.p. corrected to 60° F. and 29·92″ (sea level) barometric pressure. No. correction is applied to diesel engines because there is no suitable formula ; the values shown above are therefore the observed maximum powers.

(*b*) Engines are not expected to run indefinitely at full or maximum power output. But they can be expected to run continuously for some hours at *rated* output, which is less than maximum, defined as follows :—

(*b*1) Rated b.h.p. is defined as 85 per cent. of corrected maximum b.h.p. ;

(*b*2) Rated d.b.h.p. is defined as 75 per cent. of corrected maximum d.b.h.p.

3.—BELT TESTS

The belt tests show the power (belt horse-power, b.h.p.) that the tractor may be expected to deliver when driving a machine by the belt.

Table B—Belt Test Results

	B.H.P.	Engine Speed	Fuel	
			Gall./hr. (*c*)	lb./b.h.p. hr (*d*)
1. Rated engine speed, 1,450 r.p.m.				
2. Fast idling speed about 1,580 r.p.m.				
3. Observed maximum b.h.p. at rated speed	48·8	1,450	2·68	0·45
4. Corrected maximum b.h.p. rated speed (*a*)	48·8	No correction made for diesel engines		
5. Calculated rated load (*b*1)	41½			
6. Test at approximately rated load	41·1	1,515	2·32	0·46
7. Average loading under governor (*e*)	26	1,530	1·8	0·56
8. Equivalent engine torque at full throttle	177 ft. lb. at maximum power and rated speed 187 ft. lb. (maximum) at 1,050 r.p.m.			
9. Repeat of (3) above after 55 hours	No significant change			

(*c*) Fuel consumption in gallons/hour may be a simple unit, but it has no meaning unless we also quote the corresponding h.p. output.

(*d*) This is the "specific fuel consumption," the weight of fuel consumed per unti of energy developed by the engine ; the unit of energy here is the h.p.-hour, similar to the electrical "unit," the kilowatt-hour. When this figure is least the engine is giving its best economy or efficiency. It is easy to change from column (*c*) to column (*d*) in Table B, *e.g.*, as follows :—

2·68 galls./hr. while developing 48·8 h.p. means 2·68 ÷ 48·8 galls./b.h.p./hr. = 0·055 gall./b.h.p./hr.

0·055 gall./b.h.p./hr. × 8·17 lb./gallon for this fuel = 0·45 lb./b.h.p /hr., as shown in column (*d*).

(*e*) Line 7. Table B, represents the average performance one might expect from the engine while driving a variety of belt loads, from light to heavy. In terms of average fuel consumption, it means about 1¾ gallons an hour.

4.—DRAWBAR TESTS

(1) The following Tables C, D, and E, show the drawbar performance of the tractor, on the bitumen test track, wearing rear tyres 14 x 30, carrying maximum weight (2,480 lb. front, 6,060 lb. rear; total 8,540 lb.), working in the gears named in the tables. Height of drawbar 15 inches.

Drawbar tests, using standard and minimum weights of tractor, were carried out, but are not reported here.

Table C—Maximum Power, Rated (3rd) Gear

	DBHP (*f*)	Pull lb.	Speed m.p.h.	Wheel Slip % (*g*)
1. Rated engine speed, 1,450 r.p.m.				
2. Observed maximum d.b.h.p. at rated engine speed	44·6	3,980	4·21	9
3. Corrected maximum d.b.h.p. at rated engine speed (*a*) ...	44·6	No correction made for diesel engines		
4. Calculated rated load (*b*2)	33½			

(*f*) D.B.H.P. is the product of pull (lb.) and speed (m.p.h.) divided by 375.

(*g*) Wheel slip can be measured by noting that, in travelling a given distance, the back wheels make more turns when working under load than when running with no load on the drawbar. The difference in these revolution counts divided by the former count gives the slip as a ratio, which can be written as a percentage (quoted in these tables to the nearest whole number).

Table D—Pull at Maximum d.b.h.p

All gears, rated engine speed. *See* note (*h*)

Gear	D.B.H.P.	Pull lb.	Speed m.p.h.	Wheel Slip %
1	20	5,000	1·5	14
2	42	5,175	3·0	14
3	44½	3,980	4·2	9
4	45	3,260	5·2	7
5	Road speed not tested			

(*h*) These are not the maximum pulls available in the gears (*i.e.*, not the maximum sustained pulls), but the pull's at maximum d.b. power, *i.e.*, at full-throttle at rated engine speed.

Table E—Fuel Consumption, Various Loads, Rated (3rd) Gear

Pull lb.	Speed m.p.h.	DBHP	Per cent. of Maximum d.b.h.p.	Slip %	Fuel	
					Gall./hr.	lb./d.b.h.p. hr.
1,600	4·78	20	46	3	1·5	0·61
2,200	4·66	27	61	4	1·9	0·56
2,750†	4·61	34†	76†	5	2·1	0·50
3,200	4·54	39	87	6	2·2	0·47

† Approximately the rated drawbar load.

(2) *Interpretation of Drawbar Tests.*—(i) Drawbar tests are carried out on a hard prepared surface. Most field conditions present higher resistance to the tractor's motion, so that, in the field, the maximum drawbar pulls available in any gear will usually be less than those shown in the tables.

(ii) Wheel slip may also be greater in the field; to that extent tractor speeds in miles per hour in the field will be less than those shown in the tables.

(iii) Because of (i) and (ii) above, the drawbar horsepowers available in any gear in the field will usually be less than those shown in the tables.

5.—OTHER OBSERVATIONS

(1) *Duration of Test.*—55 hours, including running-in.

(2) *Repairs and Adjustments.*—After twelve hours running-in, a ball race in the belt pulley attachment failed. A new belt pulley attachment was fitted after the gearbox had been drained and flushed out to remove metal particles from the failed bearing.

(3) *Engine*—

Fuel settings—one, fuel pump sealed.
Heat controls—radiator, thermostat on water by-pass.
Radiator water used—half-gallon.
Lubricating oil—type used, S.A.E. 20.
Weight to engine, 19.7 lb.
Weight from engine after tests, 14.4 lb.

(4) *Tractor Weights (lb.).*

Weight Condition	Front	Rear	Total
Minimum, unballasted	2,280	4,200	6,480
Added weights	80	280	360
As usually sold	2,360	4,480	6,840
Water Ballast	....	1,020	1,020
*Standard weight	2,360	5,500	7,860
Added weights	....	560	560
Water ballast	120	....	120
†Maximum weight, heaviest recommended	2,480	6,060	8,540

* This weight, including driver and fuel, was used in finding centre of gravity.
† Weight of tractor in drawbar tests quoted in this report.

(5) *Wheels and Tyres.*

Tyres	Front	Rear
Type	Rib	Open centre bar tread
Size	7·50 x 16 x 6 ply	14 x 30 x 6 ply
Pressure	36 psi.	12 psi.

(6) *Steering.*—With track widths, front 54 in., rear 61 in. Wheel base 75 in.

Turning circles: Without brakes, 31 ft. 4 in. L.H., 31 ft. 4 in. R.H.; with brakes, 22 ft. L.H., 22 ft. R.H

Comment: Easy to steer under load, sensitive to steering wheel; hydraulic.

(7) *Centre of Gravity,* with tractor in standard weight—1 in. above, 22½ in. forward of rear axle.

(8) *Driver's Accommodation.*—Access to seat, from back of tractor. Foot-room and support, adequate. Comfort, seat flexibly sprung, adjustable fore and aft. Accessibility to controls, clutch and brake pedals 24 in. apart, centre to centre, pedal treads approximately 6 in. below loaded seat. Parking brake latch—it is easy for this to be inadvertently released.

(9) *Instruments.*—All clearly visible, markings adequate. Indications were consistent throughout tests.

(10) *Inspection of Engine and Transmission after Test.*—After testing, the tractor was partly dismantled and inspected and found to be in a satisfactory condition.

(11) *Instruction Books.*—Instructions for starting, running, and maintenance were satisfactory.

G. H. VASEY, Officer in Charge Tractor Testing.
W. F. BAILLIE, Tractor Testing Officer.
1st December, 1957. University of Melbourne.

6.—BRIEF SPECIFICATIONS

International Super AWD—7

(Based on Information Supplied by Manufacturers)

(1) *Engine*—No. AD264 5265. (I.H.C., Australia.)

4-stroke; 4 cylinders, vertical; crankshaft along tractor.

Bore, 4 in.; stroke, 5¼ in.; compression ratio, 16.7 : 1.

Rated speeds: Belt and drawbar work, 1,450 r.p.m.

Fuel type: Distillate.

Fuel system: C.A.V. pump and injectors. Filters: Water trap and replaceable element. Tank capacity, 17½ gallons.
Air Cleaner: Screen and oil bath.
Governor: C.A.V. centrifugal.
Electrical system: 12-volt battery and generator.
Starting: Electric, Bosch glowplugs.
Cooling: Pressurised water, fan, pump and thermostat, radiator louvres.
Exhaust: Vertical, I.H.C. spark arrester.
Lubrication: Oil pump and by-pass filter.

(2) *Chassis*—
4-wheel; pneumatic tyres.
Wheel base 75 in.
Track width: Front 54 in.; rear 61 in.
Tyre sizes: Front 7.50 x 16; rear 14 x 30.
Steering: Worm and gear, hydraulic.
Weight: Maximum, 8,540 lb. (see "Other Observations," section 5).

(3) *Belt Pulley*—
Optional; right side, clockwise rotation.
Diameter 11 in.; face width 7½ in.
Speed (at rated engine speed), 898 r.p.m.
Belt speed (at rated engine speed), 2,590 ft./min., not in accordance with overseas standards (namely, 3,100 ± 100 f.p.m.). Using 13 in. diameter pulley should give belt speed approximately 3,060 f.p.m.

(4) *Power Take-off*—
Optional; guarded; location, centre rear; anti-clockwise.
Speed: 537 r.p.m., in accordance with overseas standards (namely, 536 ± 10 r.p.m.).
Dimensions: 6 spline, 1⅜ in. diameter.

(5) *Drawbar—Swinging*—
Heights, as tested, 15 in., adjustable 12 in. to 20 in.

(6) *Transmission*—Conventional gears.
Clutch: Single dry plate; 12 in. diameter; pedal control.
Gear ratios and roads speeds (assuming no wheel slip) on 14 x 30 tyres, at rated engine speed, as advertised:—

Gear	Forward					Reverse
	1	2	3	4	5	
Ratio	139·6	64·8	49·9	41·2	14·8	106·5
Speed, m.p.h.	1·7	3·6	4·6	5·6	15·6	2·2

(7) *Hydraulic*—Optional, not fitted.

(8) *Three-point Linkage*—Optional, not fitted.

ERADICATING ZAMIA PALMS

Mr. J. Thompson, Mt. Helena writes: "The notes on zamia palm poisoning of cattle in the February issue prompted me to pass on this hint to new farmers who may not be familiar with methods of destroying the palms.

"During late spring and early summer, work over the paddock in strips or sections and treat the palms with kerosene. I use a 2 oz. round fine-cut tobacco tin as a measure. Pull out the centre leaf and pour about half a tinful of kerosene into the heart of the plant, then lay the detached leaf across the palm as an indication that it has been treated.

"Cattle will usually steer clear of the kerosene-treated palms and the plants soon die. Where the leaves are firmly attached and do not pull out easily, apply the kerosene to the centre of the palm and then repeat the treatment at a later date when the leaves loosen."

(The kerosene treatment is the standard control method advocated by the Department. The use of a "spear" or metal spike thrust into the heart of the palm to speed up penetration of the kerosene was recommended at one time, but in later years, good results were obtained simply by pouring the kerosene into the crown of the plant. Pulling out a leaf would probably be still more effective—Ed.).

Control of Red-legged Earth Mite and Lucerne Flea

TREATMENT OF SEED WITH SYSTEMIC INSECTICIDES

By M. M. H. WALLACE, Principal Research Officer, C.S.I.R.O., Division of Entomology, W.A. Regional Laboratory, Nedlands, W.A.

THE red-legged earth mite, *Halotydeus destructor* (Tuck.), and the lucerne flea, *Sminthurus viridis* (L.), are at present controlled effectively, cheaply and safely by a combined DDT/malathion spray (Jenkins, 1956, 1957) and this continues to be the general recommendation for farmers. However, this combination has some disadvantages. The DDT in the spray ensures some residual control of the earth mite but has the unfortunate property of toxicity to the bdellid mites which are useful predators of the lucerne flea. The malathion in the spray assists the DDT to control the earth mite and provides a good, quick kill of the lucerne flea, but it has no residual action. As a consequence, lucerne flea populations tend to build up again rapidly after treatment, unless a second treatment is applied.

There are, therefore, two weaknesses in the present DDT malathion mixture, viz. lack of residual toxicity to the lucerne flea and some toxicity to the useful bdellid mites.

Recent laboratory and small-scale field tests at the C.S.I.R.O. W.A. Regional Laboratory, Nedlands, have shown that the new systemic insecticides may help to overcome these difficulties.

Systemic insecticides are materials which can be taken up by the plant, either from seed, from the soil, or through the leaves. The insecticide becomes distributed throughout the plant in varying proportions, so that an insect, when feeding, takes some into its system. Mites and small insects, such as aphides, thrips, leafhoppers, etc., may absorb enough to cause death. Results have been more erratic with larger insects, although good control has been achieved in some cases.

Seed treatment, that is the coating of the seed with a layer of insecticide dust prior to sowing, was tried as a means of protecting subterranean clover and other plants, such as pea and vetch, against attack by the red-legged earth mite and lucerne flea. The results of these small-scale tests were very encouraging and a brief account of them is given here so that, should any of the materials become available, farmers may try them out for themselves in small areas. It should be emphasised however, that further tests must be carried out before precise recom-

mendations on dosage rates, methods of application, etc., can be given.

MATERIALS TESTED

1. Demeton ("Systox") and methyl demeton ("Metasystox"), obtained as a 50 per cent. material on active charcoal.

2. "Thimet," obtained as a 44 per cent. material on active charcoal.

3. "Sayfos," obtained as an 80 per cent. wettable powder.

"Systox" and "Thimet" are highly poisonous materials and must be handled with great care. "Metasystox" is less poisonous and "Sayfos" is reported to have a very low mammalian toxicity. Nevertheless, care must be exercised when these chemicals are handled. It is important that users should adhere strictly to the precautions advised by the manufacturers.

METHODS

The best method of adding the insecticide to the seed is not yet known but good results have been obtained by simply tumbling the seed in a suitable container with the required amount of insecticide dust. Water can be added to the seed, if desired, and this has the advantage of reducing slightly the amount of free dust in the atmosphere. About two pints per 100 lb. subterranean clover seed seems to be quite satisfactory. Another method is to make up a slurry of the insecticide in water and add this to the seed in the container.

In the experiments so far conducted the seed was planted within a few hours of treatment. However, there is some evidence to suggest that treated seed could be stored for some time, if necessary.

QUANTITIES

In the early experiments the damp seed was simply tumbled in an excess of insecticide dust. Later on quantities ranged from $\frac{1}{4}$ to 4 lb. insecticide dust per 100 lb. seed.

RESULTS

The results indicate that all materials tested gave at least some control of both the red-legged earth mite and lucerne flea.

In a pot trial, subterranean clover seedlings arising from seed tumbled in an excess of "Systox" and "Metasystox" proved toxic to both these pests for periods of up to eleven weeks after sowing in the case of "Systox," and seven weeks in the case of "Metasystox." The latter appeared to lose toxicity to the lucerne flea more quickly than to the earth mite.

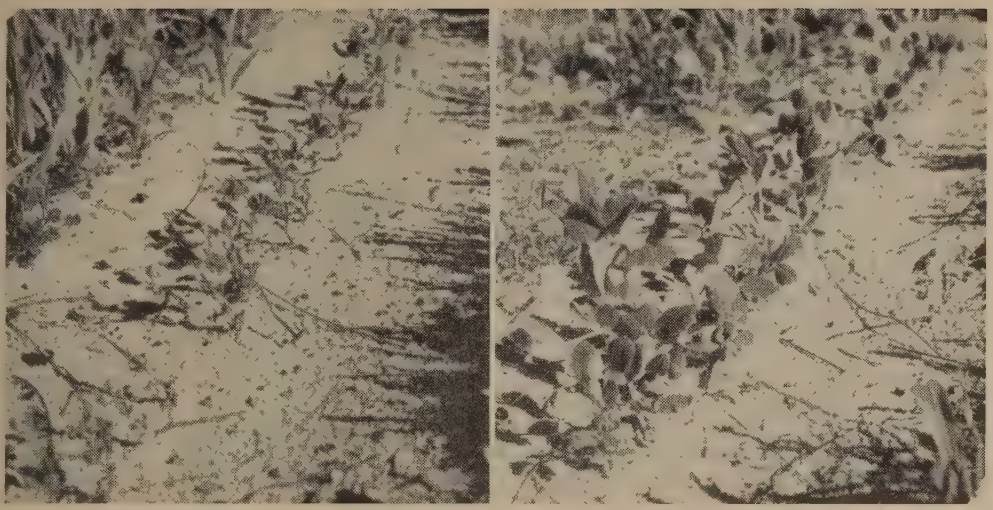
A small field trial comparing the effects of seed treatment of subterranean clover (Dwalganup), common vetch, *Vicia sativa* L. and field pea, *Pisum arvense* L. with "Systox," "Metasystox" and "Thimet," was commenced in the autumn of 1959. The seed after treatment with an excess of insecticide, was sown out in rows with areas of natural mite-infested pasture between the rows. This ensured a continuous invasion of earth mites on to the seedlings. The results are summarised in Table 1.

TABLE 1.

The influence of seed treatment with "Systox," "Metasystox" and "Thimet" on earth mites attacking the resulting seedlings. Figures show total numbers of dead mites counted around the first ten seedlings in each row twelve days after sowing. Total of four replications.

Treatment	Subclover	Vetch	Pea
Control—no treatment	....	....	1
"Systox"	5	423	979
"Metasystox"	1	216	782
"Thimet"	639	1,904	2,110

All treatments produced at least some kill of the earth mite up to twelve days after sowing, but "Thimet" was clearly the most effective of the three. Detailed observations were discontinued at this stage, but subsequent casual inspections indicated that mites were still being killed up to six weeks after sowing in the "Thimet" treatment. Although the plants arising from the treated seed suffered some damage as a result of the continuous mite attack, they obtained a good deal of protection and grew much more vigorously than the untreated series. Under normal conditions this type of continuous attack would not occur, except perhaps at the edge of crops, and the plants would receive almost complete protection for an extended period.



Photographs showing (right) the increased growth of peas where the seed had been treated with "Thimet" prior to sowing. Compare with plants grown from untreated seed (left). The increased growth is due principally to protection from earth mite attack

The other insecticide tested, namely "Sayfos," did not become available until late in 1959, so that the tests with this insecticide were restricted to a few pot trials.

The results of one such trial with subterranean clover are shown in Table 2. The mites and fleas were counted after feeding upon the plants for from five to eight days.

TABLE 2.

The influence of treatment of subterranean clover seed with "Sayfos" on earth mites and lucerne flea feeding upon the resulting seedlings. Table shows percentage mortality after from 5-8 days of feeding.

Dosage Rate lb. "Sayfos" per 100 lb. Seed	14 days after Sowing		34 days after Sowing		55 days after Sowing	
	Earth Mite	Lucerne Flea	Earth Mite	Lucerne Flea	Earth Mite	Lucerne Flea
Control—No treatment	26·1	6·7	33·3	51·9	*	37·9
¼ lb.	96·1	90·0	81·7	63·1	*	36·7
1 lb.	100·0	98·0	100·0	80·0	*	38·8
4 lb.	98·2	98·1	100·0	86·3	*	71·7

* No mites available for testing.

The toxic action was fairly rapid when the seedlings were only young (14 days after sowing) but three weeks later (34 days after sowing) the time required to produce the same kill increased from two to six days. However, there was clear evidence of residual action of at least one month in all treatments. Fifty-five days after sowing, only the heaviest dosage (4 lb. "Sayfos" per 100 lb. seed) appeared to have any substantial residual influence.

EFFECT OF EMERGENCE AND GROWTH OF SEEDLINGS

Germination rate and seedling emergence were depressed to a greater or lesser degree by all treatments. At the lower rates of application, ¼ to 1 lb. per 100 lb. seed, the depression was only very slight and would probably be of little or no significance in practice. "Metasystox" was the most highly toxic to the seed and in one instance reduced emergence of subterranean clover to 22 per cent.

"Sayfos" was less toxic, and even at 4 lb. insecticide per 100 lb. seed, the depression in clover emergence was only about 10 per cent. At this dosage, however, many of the seedlings which did emerge were very pale in colour and subsequent growth was severely retarded.

Some loss of colour and stunting in early growth occurred at the 1 lb. dosage, but recovery was usually good, and in fact, there was evidence of substantially increased growth in the later stages even where insect attack appeared to be non-existent. Other workers, e.g., Guyer, Brown and Wells, 1958, and Brown, 1957, have reported similar increases in weight in treated seedlings, in the absence of any apparent insect attack. It seems probable that the systemic insecticide treatment of the seed boosted seedling growth by means other than protection from direct damage by insects.

"Thimet" was relatively non-phytotoxic and appeared to be fairly safe to use up to about 4 lb. per 100 lb. seed. It should be noted that there is some variation in the response of different plant species.

EFFECT OF NODULATING BACTERIA

Both "Thimet" and "Sayfos" at high concentrations can inhibit growth of these bacteria. On the other hand, at lower concentrations growth is not seriously affected and may even be enhanced. The practical implications of the influence of these treatments on nodule formation have yet to be examined. It is likely that the problem will be a serious one only in certain special circumstances, for example, where the only possible source of the bacteria is from the inoculated seed.

CONCLUSIONS

Treatment of legume seed with systemic insecticides may provide an effective means of protecting young seedlings from attack by the red-legged earth mite and lucerne flea. Quantities of insecticide required have yet to be determined accurately, but about 1 lb. active ingredient per 100 lb. seed appears to be satisfactory.

The advantages of this treatment are (1) rapid initial kill of both pests; (2) prolonged residual action; (3) lack of toxicity to useful predators, such as the bdellid mite, and (4) ease of handling, especially in the case of "Sayfos" where the mammalian toxicity is low.

Experiments on the use of these insecticides in established pastures will be carried out in 1960. Until these results are obtained the present control methods with malathion and DDT should be used where necessary.

SUMMARY

Treatment of the seed of subterranean clover and other legumes with the new systemic insecticides prior to sowing, may provide an effective means of protecting the seedlings from attack by the red-legged earth mite and the lucerne flea. "Sayfos," applied at from ¼ to 1 lb. insecticide active ingredient per 100 lb. seed was effective for several weeks in small-scale tests. "Thimet" may require slightly higher dosages. For trial purposes about 1 lb. insecticide per 100 lb. seed is recommended.

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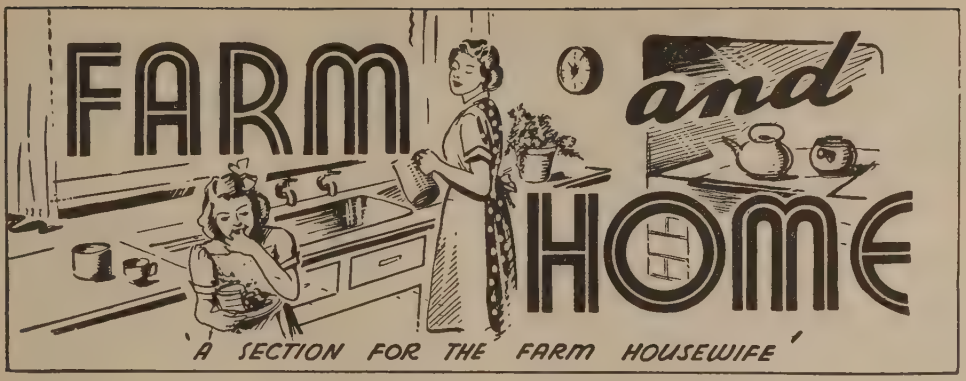


The Linen Press

By HELEN M. GLOSTER

A "LINEN PRESS" in the real sense of the word is an obsolete piece of household equipment now to be found only in museums. It is a contrivance usually of oak and was used for pressing sheets, table napkins and other linen articles requiring flattening. It resembled the modern office press.

In the 17th and 18th Centuries when large homes were well staffed with servants a linen press was commonly used. Folded linen was stacked between the two flat pieces of wood and pressure exerted by means of a lever or screw. By this means the linen was flattened and compressed so that it was smooth, and took up less room in storing.

The "mangle" as a device for pressing came at a later period and superseded the linen press. However the name "Linen Press" continued to be used for the room or cupboard in which linen was stored, and the name is still in use today.

In some modern homes the press is an airy built-in cupboard preferably in a recessed wall.

Failing a built-in cupboard, special linen cupboards may be bought or made to specifications.

Whether built-in or movable, certain features are desirable.

THE POSITION

As linen will become mildewed if kept in a damp place, a dry airy part of the house should be selected. Against an inside wall or against a wall with a stove or fireplace on the other side are good places. If you have hot water pipes, near the pipes should also be a good position.

A linen cupboard should not be placed in the bathroom or laundry as steam is liable to penetrate to the linen.

THE SHELVES

Smooth white pine wood is suitable for shelves as it will not stain the clean linen. Shelves should be 12 in to 18 in. apart and wide enough to take folded or rolled sheets, towels and tablecloths.

There are numerous ways in which the shelves may be ventilated, the simplest being to have a gap between the front of the shelves and the door.

Some people prefer slotted shelves or shelves with small holes bored at regular intervals through the wood.

ARRANGEMENT OF THE SHELVES

There are no hard and fast ways of arranging the linen cupboard providing the housewife adheres to a few simple rules.

Articles that are used most frequently are best placed on a middle shelf at about shoulder level.

Blankets which are being stored for the summer, could go on the top shelf where they are out of the way. This rule applies to anything not in frequent use.

Small articles, like table napkins and doyleys, could be placed in a shallow drawer (if there is one) or stored neatly in boxes.

Articles of a kind should be kept together.

Fold articles of a kind uniformly to the same size and see that they are stacked with folded sides facing the front of the cupboard for neat appearance.

Linen being returned to the cupboard after laundering should be placed at the bottom of the clean piles and linen taken out, taken from the top. In this way everything in the cupboard gets used in rotation.

Keep un-repaired linen apart from the regular piles, until mended.

The linen press should be reserved for clean linen only. This applies particularly to blankets. If these are put away without being washed you may expect an invasion of moths and silverfish before too long.

FOLDING AND STORING LINEN

Here are a few suggestions—

See that all articles are aired thoroughly before putting away.

Table Cloths and Breakfast Cloths.

These are usually screen-folded during the ironing process.

Fold, almost in half, roll loosely from the centre then keep roll in position with a piece of tape.

Sheets.

Fold twice, making a long strip, fold almost in two and roll, or fold to a neat rectangle.

Towels.

Fold once making a long strip, fold almost in two and roll, or

Fold once making a long strip, then fold the strip two or three times to make a neat flat rectangle.

Place folded sides to the front when placing on the pile in the cupboard.

Pillow Cases.

Fold in two, to form a strip. Fold in half, then in three. See that all tapes are tucked inside.

Tea Towels.

Fold once, making a long strip, then fold twice to make a rectangle.

PROTECTION FROM SILVERFISH, MOTHS AND OTHER PESTS

Spray the cupboard periodically with a household insect spray.

See that everything that goes into cupboard is absolutely clean.

Sprinkle naphthalene flakes or place a few moth-balls or cakes of camphor on each shelf.

Blankets should be washed and well aired before storing. Place in unbleached calico bags, plastic bags or wrap in newspaper after sprinkling with naphthalene flakes.

Linen that is to be stored for any length of time is better left unstarched. The starch could cause mildew, or provide food for moths and cockroaches.

TO REPAIR A WORN SHEET

There is always the problem of the sheets which wear thin in the centre but are quite good towards the selvedges.

If these are repaired they will last for a further period, especially if used for small children's beds. It is also a good idea to keep these sheets for beach holidays.

Method.

1. Cut off the worn strip from the centre of the sheet.
2. Place selvedges together right sides inside and pin.
3. Machine selvedges together close to the edge, remove the pins.
4. Hem the raw edges at the sides.
5. Strengthen the four corners with tape.

To Tape the Corners of the Sheet.

1. Take pieces of tape 4 in or 5 in. in length and ¾ in. to 1in. in width.
2. Fold each piece in two and machine diagonally across each piece, so that it opens out in the shape of an "L."

Tuck and machine a cornered piece of tape on the wrong side to each corner of the sheet.

Up-Side-Down Cake

TRY this recipe when you would like something a little different from the usual dinner sweet, or serve as cake for afternoon tea or supper.

Ingredients.

(a) 1 tablespoon butter or margarine.
1 tablespoon raw or brown sugar.
½ to 1 teaspoon grated lemon rind.
1 tin fruit salad (drained).

(b) 2 oz. butter or margarine.
2 oz. castor sugar.
1 egg.
2 tablespoons milk few drops vanilla.
1 tablespoon lemon juice.
4 oz. self raising flour.

Method (a).

Cream butter, raw sugar and grated lemon rind.

Grease a 7 in. cake tin and spread with mixture.

Place a layer of well-drained fruit salad over the mixture.

Method (b).

Cream butter and sugar, using ingredients in list (b).

Add vanilla and egg, beat well.

Add lemon juice, flour, milk, fold in lightly.

Spread on top of fruit.

Bake in a moderate oven 30 to 40 minutes.

Cool for ten minutes, loosen the sides and turn on to a warm plate.

Serve with whipped cream, ice-cream or custard.

Variations.

Any well-drained tinned or stewed fruit.

Stewed peaches and chopped walnuts.

Stewed apples and stewed prunes, cooked separately and arranged in a design.

Stewed dried apricots and blanched split almonds.

N.B.—A good plain cake mix may be used instead of the cake given in the recipe.

ANOTHER RECIPE

This recipe will make quite a different cake from the previous one.

Ingredients.

2½ oz. butter.
5 oz. brown or raw sugar.
pinch salt.
Vanilla essence.

Method.

Cream these together then add, 2½ teaspoons honey.
1½ teaspoons honey.
1½ teaspoons malt extract.
1 dessertspoon water.

Mix well and spread on the bottom of a well greased tin.

Arrange well drained cooked fruit to make a pattern.

Cover with sponge mixture. Bake in a moderate oven.

N.B.—Fruit syrup may be added to the sponge instead of water. Any sponge mixture may be used. This cake when turned out makes a decorative dish for a party table.

BIRD-PECKED FRUIT

The average householder with a few vines and fruit trees around the home loses a great deal of fruit each summer from bird pecks.

This method of protecting the fruit is particularly effective for grapes.

Save worn nylon stockings, wash and put away until the fruit season.

Cut each stocking in two or three pieces according to the size of the bunches of grapes and close one end with a piece of string a rubber ring, or machine across one end.

Before the grapes are fully ripe and at the first sign of bird pecking, enclose each bunch in a stocking. Tie stocking loosely at the top or fasten with a spring peg.

Start saving old stockings now! Next summer will be too late!

YELLOW TINGLE

(*Eucalyptus Guilfoylei* Maiden.)

A—Branchlet with leaf and panicle of flowers; B—Flower buds; C—Anthers; D—Fruits; E—Section of fruit; F—Seeds

[Frankland River, Gardner

TREES of Western Australia

By C. A. GARDNER, Government Botanist

No. 63—YELLOW TINGLE

(*Eucalyptus Guilfoylei* Maiden.)

THE yellow tingle is one of the large forest trees of the lower South-West, and although it possesses many good qualities, its limited range renders it of less importance than its associates—the jarrah and karri. Its area of distribution extends from the Denmark River in the east, to the Deep River in the west, in which area it is usually found fringing the karri forest, mainly in the low-lying situations.

Attaining a height of 150 ft., although usually about 120 ft. high, with a trunk up to 6 ft. in diameter, the trunk is relatively short (usually about 50 ft. long), and the branches are widely spreading. The bark is dark grey, rough throughout, fibrous, not unlike that of the blackbutt, but less friable, and resembling that of the red tingle, with which it is sometimes confused, although the two are very dissimilar in the flowers and fruits.

The timber is yellow, and exceptionally hard and durable. It withstands long submersion in water, and an experimental pile placed in position when the present Frankland River bridge was built, is still quite sound. Experiments made by the Forests Department with this timber for sleeper purposes in 1937, have proved that the timber is very suitable for this purpose, and termite resistant. The tree prefers low-lying situations, and is fairly common along the watercourses in the area mentioned above.

Botanically the tree possesses two unusual characteristics which may be seen by reference to the accompanying plate. The inflorescence (A) shows that the umbels are arranged in a terminal panicle, a feature common in many tropical species of the genus, but confined to this species in the South-West. The second feature is the shape of the anther (C).

The anthers instead of opening in vertical slits or pores, open laterally, and when seen from below resemble a pair of spectacles. This character is peculiar to this species. In the foliage and fruits the tree is not unlike the karri, and the leaves spread horizontally, are deep green above and paler underneath like those of the karri.

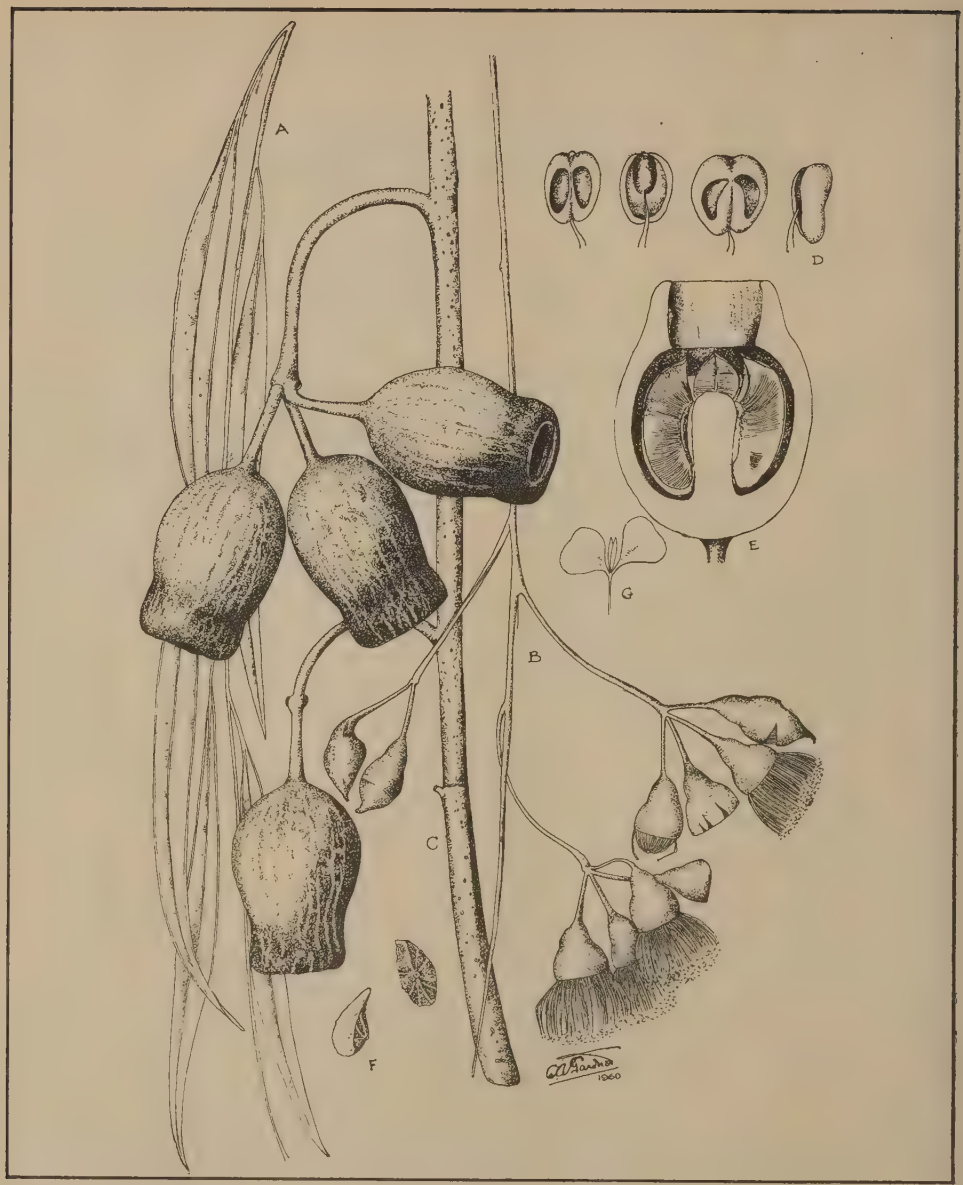
The yellow tingle flowers in January and February.

No. 64—WEEPING GUM

(*Eucalyptus sepulcralis* F. Muell.)

IN naming and describing this species, Baron von Mueller states that "It was chosen because it will be destined to add another emblem of sadness to the tree-vegetation of cemeteries in climes similar to ours." Those who have seen this tree will, I think, rather regard it as one of our most attractive and graceful species and worthy of a place in any scheme of cultivation.

Attaining a height of up to 25 ft., the trunk rarely exceeds two inches in diameter, so that it is one of the most slender of trees, and its powder-white bark

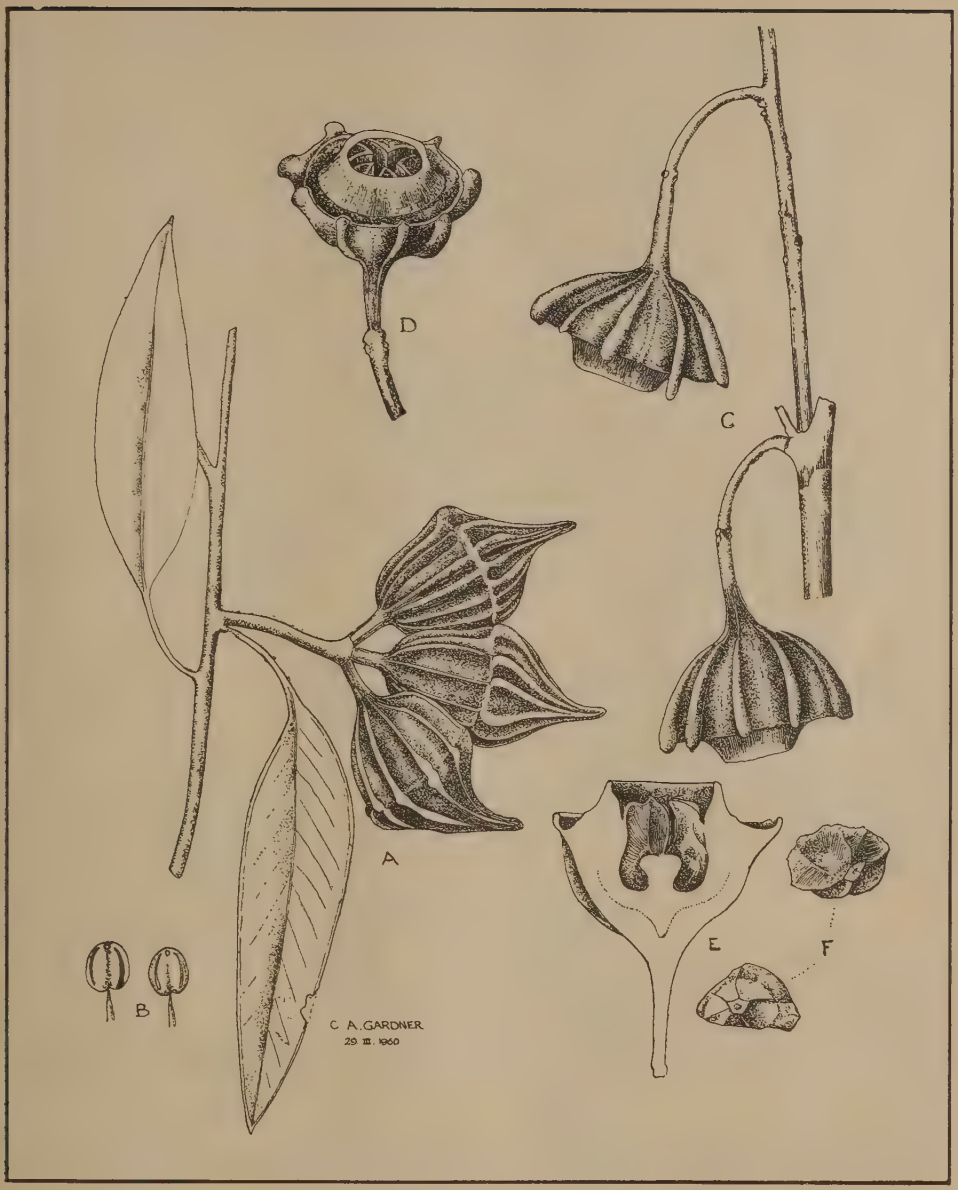


WEEPING GUM

(*Eucalyptus sepulcralis* F. Muell.)

A—Branchlet with leaves; B—Flowering branchlet; C—Branchlets with fruits; D—Anthers; E—Fruit in section; F—Seeds; G—Cotyledons

[Near East Mount Barren, Gardner 12088



KINGSMILL'S MALLEE

(*Eucalyptus Kingsmillii* Maiden et Blakely.)

A—Branchlet with leaves and umbel of flower buds; B—Anthers; C and D—Fruits; E—Fruit in longitudinal section; F—Seeds

and pendulous branches and olive-green leaves render it a singularly elegant plant.

First collected on the Thomas River eastward from Esperance by Campbell Taylor, who compares it to a weeping willow, the species is now known from the hills near East Mount Barren and the Eyre Range, occurring in sandy soil among quartzite rocks. The leaves, flowers and fruits are all pendulous, the leaves tapering at both ends, rather thick and very narrow. The flowers are on long stalks on still longer peduncles, the filaments a pale yellow.

The fruits are urn-shaped, olive-green in colour, turning to a leaden grey when mature, and not unlike those of the marri tree, but relatively longer. The anthers exhibit some degree of variation. Described as opening in slits which are confluent at their apices, among a number examined this was not found to be the case except in a very few old anthers. The closest relative of *E. sepulcralis* is the Apple Fruited Mallee described in this series recently.

The species germinates freely from seed. The first leaves are broad and blue-green, and the typical foliage is not produced until several of the broad leaves have been formed. It grows readily in the sand around Perth, and although very rarely seen in cultivation it has a definite place in the gardens of the future, but should be protected from strong winds. It flowers in January and February.

No. 65—KINGSMILL'S MALLEE

(*Eucalyptus Kingsmillii* Maiden et Blakely.)

THIS species is one of the most attractive of all our mallees. Attaining a height of about 15 ft. it is more commonly 6 to 8 ft. tall, and in cultivation is a widely spreading shrub. The bark of the main stems is rough and grey in the lower parts, that of the smaller branchlets greenish brown, and the branchlets usually red. It commonly spreads to a diameter of 8 or 10 ft.

It is of open texture, in that the branches are not dense, so that the buds, fruits and flowers are the more conspicuous. It inhabits the red sand of the dry interior mainly between Sandstone, Nallan and Meekatharra, southward to Lawlers and eastwards to Carnegie, and the writer found it on the summit of Mount Bruce in the Hamersley Range in 1932. It has also been recorded from near Mundiwindi. The leaves are relatively small, a dull green or almost grey in colour, and the lateral veins are scarcely conspicuous.

The flowers are in umbels of three, on distinct stalks. The buds, flowers and fruits are distinctly ribbed with eight more or less equally-spaced ribs, and occasionally eight intermediate less conspicuous ribs. The operculum varies from hemispherical to almost conical and is always beaked, with the same number of ribs as the calyx. The buds and young fruits are red in colour, but the fruits gradually assume a grey-brown colour when the seeds are ripe.

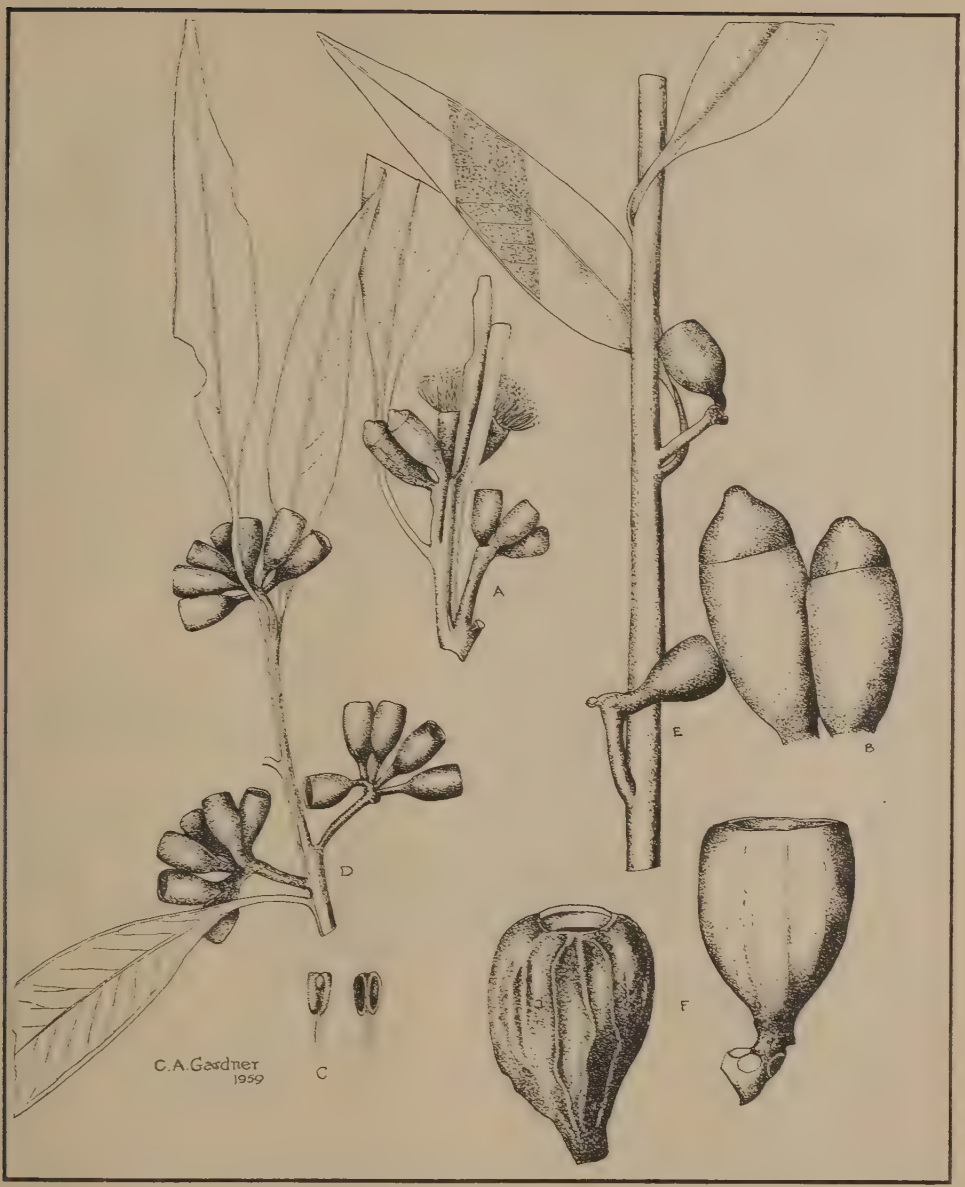
The rather long filmaments of the anthers are either red or pale yellow, as in *Eucalyptus pyriformis,* to which it is very closely related. The short anthers open in longitudinal parallel slits, and the shrub flowers from May to August.

Little known in cultivation, this plant proves very hardy under coastal sandy conditions, but is more spreading and bushy than the forms seem in the field. It is more attractive than *E. pyriformis,* and I would regard it as among the most attractive of the shrubby species for local cultivation in gardens.

No. 66—HOPETOUN MALLEE

(*Eucalyptus leptocalyx* W. F. Blakely.)

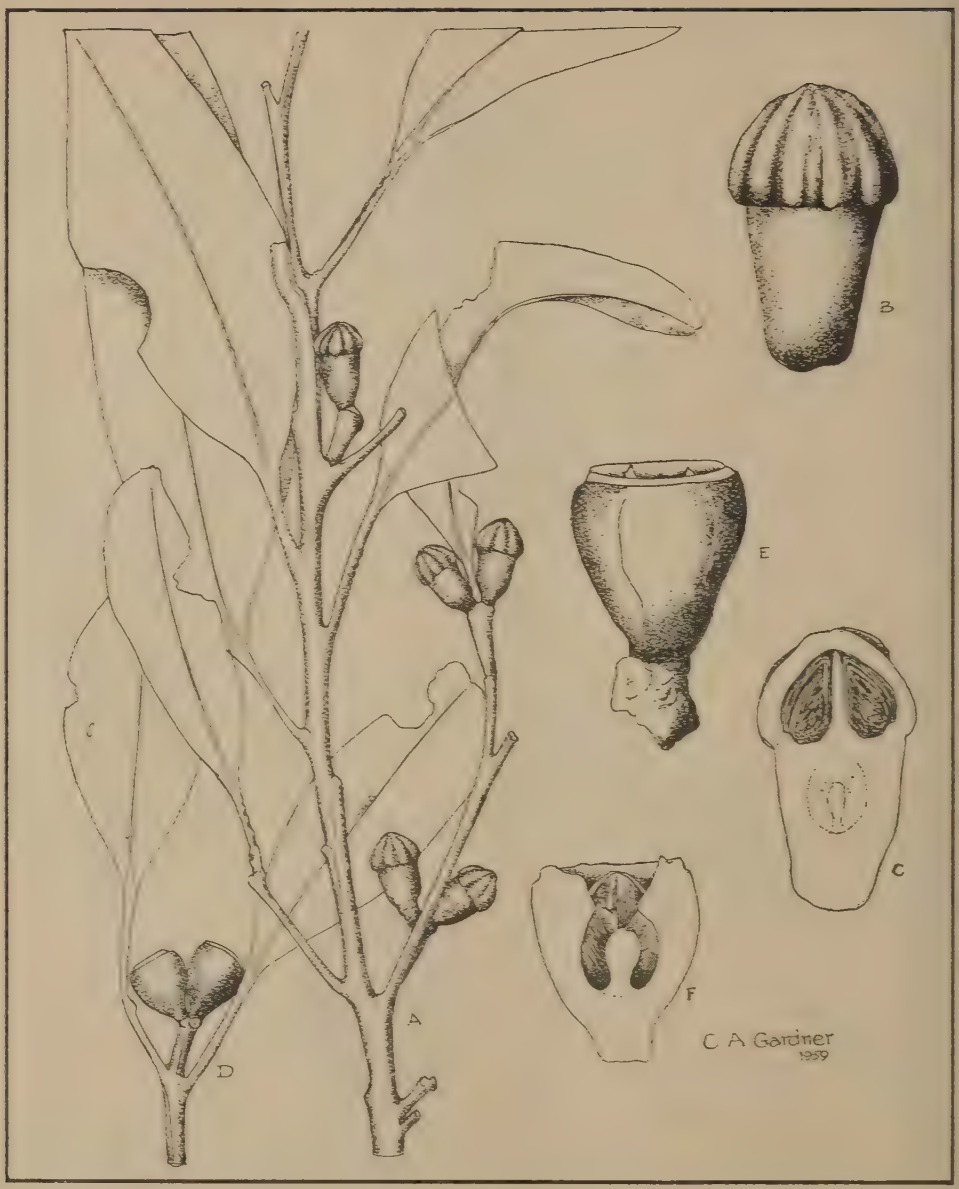
THE Hopetoun mallee is a densely-branched shrub 8 to 12 ft. tall, with a rough grey bark on the lower parts, becoming smooth on the younger branches. The branchlets are acutely angled. The thick erect leaves are lustrous with the midrib impressed on the upper surface, the lateral veins scarcely conspicuous. The leaves are copiously oil-dotted.



HOPETOUN MALLEE

(*Eucalyptus leptocalyx* W. F. Blakely.)

A—Flower buds and flowers; B—Flower buds (enlarged); C—Anthers; D and E—Fruits; F—Fruits (enlarged)
[Nine Mile Tank northward from Hopetoun, J. H. Maiden November 1909 (Type)



CAPPED MALLEE

(*Eucalyptus pileata* W. F. Blakely.)

A—Branchlet with leaves and flower buds; B—Flower bud enlarged C—Flower bud in section; D—Fruit; E—Fruit (enlarged); F—Fruit in longitudinal section

[Desmond near Ravensthorpe, J. H. Malden November 1909 (Type)

The flowers are in umbels, the stalks of which are much thickened or flattened upwards, and arise from immediately above the insertion of the leaves. Commonly there are ten flowers in each umbel, but frequently this number is reduced to seven or eight. The filaments of the anthers are yellowish-white in colour, and the species flowers in January in the Ravensthorpe-Hopetoun district.

Just how common this mallee is we do not know. The specimen illustrated is the one from which the species was named, but, exhibiting certain differences, the species extends eastwards to Esperance, and northwards to Shark Lake and Salmon Gums, while it is very common along the Jerdacuttup River, and around Kundip on the stony rising ground. In general the bud-cap of the Kundip-Hopetoun shrubs is blunt, while in the eastern areas towards Salmon Gums, this organ becomes more pointed. There still remains much to be discovered concerning this species, which is here illustrated for the first time.

No. 67—CAPPED MALLEE

(*Eucalyptus pileata* W. F. Blakely.)

THE name, *pileata*, applied to this tree, comes from the Latin, pileus—a cap fitting close to the head and worn by the Romans at feasts, especially the Saturnalia. It is not a particularly appropriate name, however, since a number of species of Eucalyptus have opercula which are even more cap-like.

The species is a mallee growing to a height which varies from 4 to 12 ft., with a smooth, silver-grey bark and erect, lustrous, rather thick leaves which are narrow and taper into acute points, with an impressed midrib on the upper surface, and inconspicuous lateral veins. It occurs in a number of forms, being common on the clay soils around Ravensthorpe (the original specimens came from this district). It is found around Esperance, northward to Salmon Gums, and still further north, around Boorabbin and Karalee, we again find this plant, but the operculum is much more narrowly and sharply ribbed. The specimens from Salmon Gums appear to be from larger mallees and here again the ribbing of both operculum and calyx-tube are more defined than in the Ravensthorpe specimens. Furthermore, the Ravensthorpe plants flower in December, while those from Salmon Gums are in flower in April.

In general this plant can be distinguished from its closest relatives by the following characters: It is never a tree but always a mallee; the operculum is broader than the calyx-tube, is much shorter, and corrugated or ribbed, and the fruit is never deeply ribbed or corrugated.

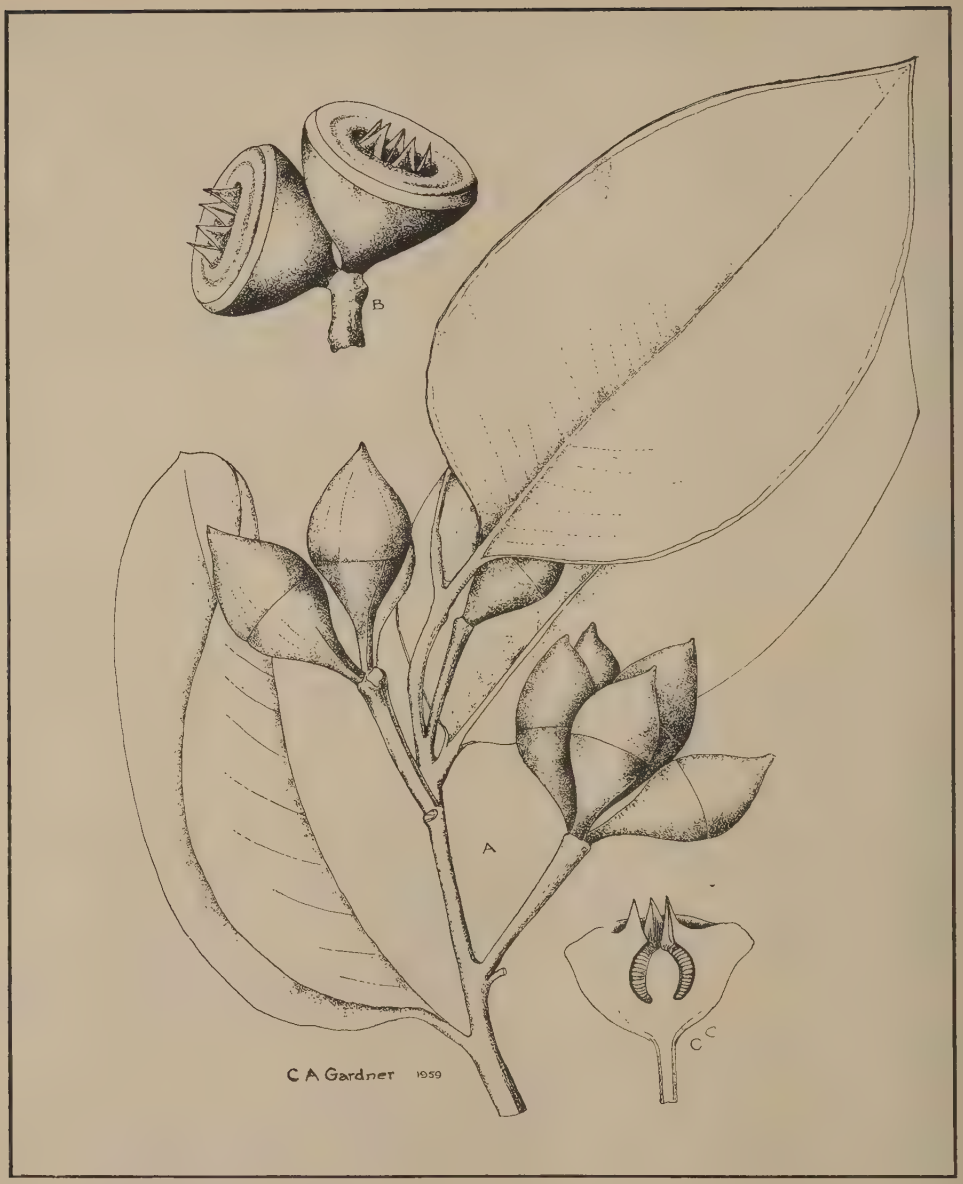
No. 68—*Eucalyptus Carnabyi* Blakely and Steedman

THIS ornamental species is very imperfectly known. The original specimens came from the Victoria Plains where it was collected by Carnaby and Steedman in March, 1937. Later Mr. Steedman stated that only one bush had been seen, and that this came from Barberton, growing on the edge of an area of Eucalyptus macrocarpa.

In 1958 I received a small fragment from near Piawaning, and another plant growing on the roadside north of Bolgart appears to be this plant also, but the flowers are about the size of those of *Eucalyptus macrocarpa*. The plant is very closely related to *Eucalyptus macrocarpa*, differing essentially (as the illustration shows) in the pointed stalked leaves, and in the number of flowers in the umbel.

It was described as a mallee up to 10 ft. tall, with several slender stems from the rootstock, covered with a brownish bark for 3 to 5 ft. from the ground, otherwise smooth and powdery. The filaments are stated to be "white or yellowish," but it is probable that red flowers also occur.

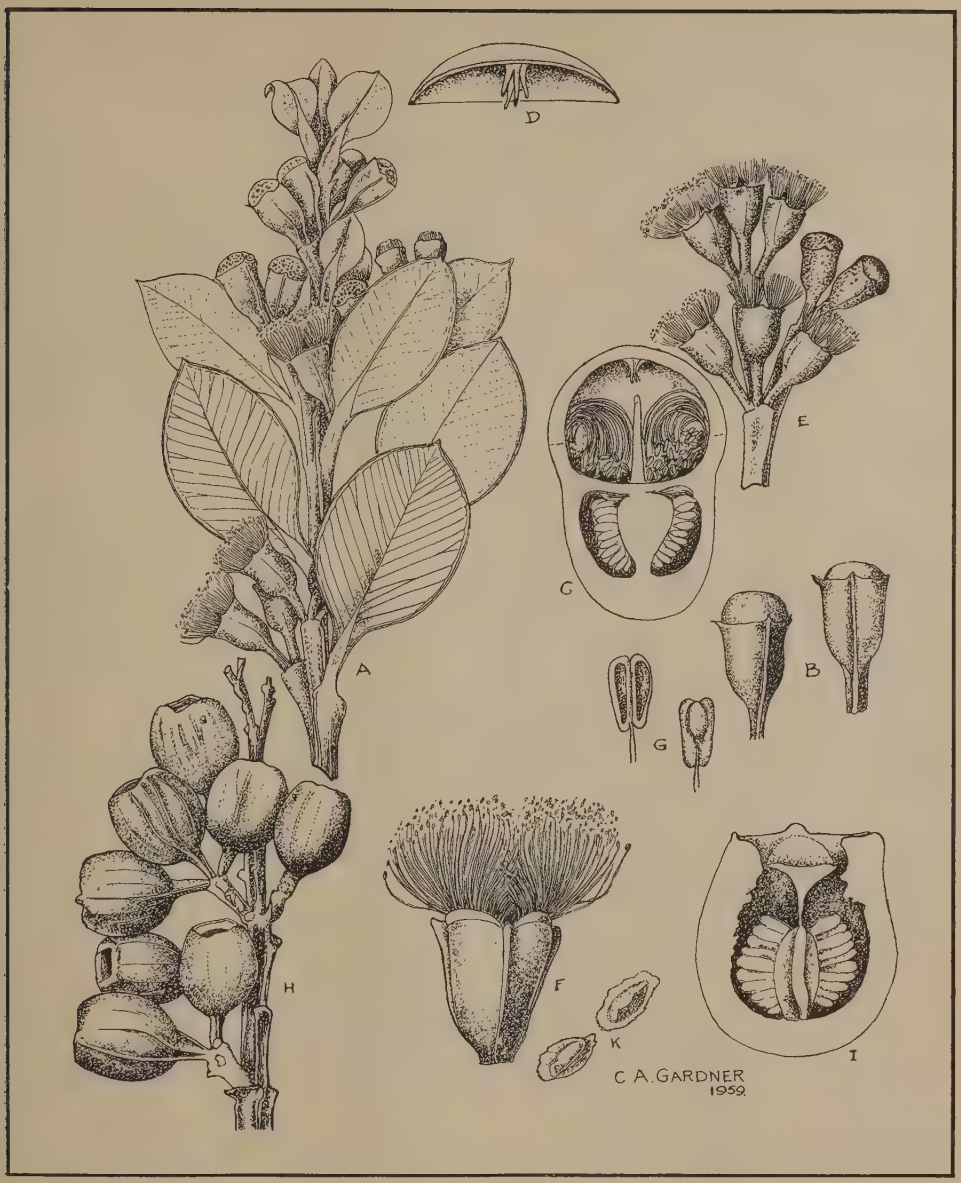
There is some evidence to show that this plant is no more than a variety of *Eucalyptus macrocarpa*, a species exhibiting much variation in leaf shape, presence or absence of leaf-stalk and the same of the flower-stalk, the essential difference



(Eucalyptus Carnabyi Blakely and Steedman.)

A—Branchlet with flower buds; B—Fruits; C—Fruit in longitudinal section

[Near Piawaning, Curtis 1959



TALLERACK

(*Eucalyptus tetragona* (R.Br.) F. Muell.)

A—Branchlet with flowers; B—Flower buds; C—Flower bud in longitudinal section; D—Operculum seen from below and showing the four small processes in the middle; E—Flowers; F—Flower (much enlarged); G—Anthers; H—Fruit; I—Section of fruit; K—Seeds

(Dalyup near Esperance, Gardner.)

being that in *E. Carnabyi* the flowers are much smaller, and several (the original description states three) in the umbel. More will be said of this when we deal with *Eucalyptus macrocarpa.* In the interim the writer would be pleased to receive any specimens which the reader may have of this interesting plant.

No. 69—Tallerack (*Eucalyptus tetragona* (R. Br.) F. Muell.)

INDICATIVE of poor white sandy soil, usually with a gravelly subsoil, the Tallerack extends on the light soil types from Sukey's Peak just outside Cranbrook, eastward to at least as far as Cape Arid, not far from Israelite Bay. It extends inland as far as Gnowangerup and Borden to the north of the Stirling Range, thence to the Newdegate and Grasspatch districts. Another area of distribution, occurring under the same soil conditions occurs in the lower Hill River area, and from there northwards to Lake Logue.

The plant is usually a mallee 6 to 8 ft. in height, but specimens of 20 to 25 ft. have been recorded on the south coast. The bark is grey and flaky in the lower parts, shedding in rather thick plates; upward it is yellowish-brown and smooth, but the branchlets are covered with a white powdery exudation, which extends to the foliage and flower buds. The leaves are stalked with a thick stalk, seldom above three inches in length and often almost as broad, prominently veined, and rich in oil, but the oil is of low quality and contains but little cineol. The flowers are borne in clusters of three on flat stalks, and the buds are 4-ribbed and the calyx 4-toothed. The bud-cap (operculum) is usually hemispherical, white and smooth. When it has fallen there may be seen inside four small tooth-like projections which may represent the vestiges of the incurved tips of the four petals which have become fused to form the operculum. The stamens are pure white, and in four tufts or bundles alternating with the four teeth of the calyx-tube. The fruits are almost globular in the south coastal forms, but often more urn-shaped in the plants from the west coast.

The name *tetragona* refers to the four angles of the flower-buds.

No. 70—(*Eucalyptus micranthera* F. Muell. ex Benth.)

THIS mallee bears no accepted vernacular name. The name *micranthera* refers to the small anthers of the flowers. The species was first collected by George Maxwell about 1850 on a white sandpatch, two miles westward from Eyre's Relief. This latter place is today known as Eyre, and is situated about half way between Cape Arid and Eucla, on the coast roughly southward from Burnabbie Station.

Maxwell described the plant as a mallee 6 to 10 ft. tall. The material was in bud and flower only, no fruits being obtained. Many years later, Mr. H. P. Turnbull on the Alexander River collected further material which was sent to Mr. Maiden at the Botanic Gardens Sydney, and was figured in the "Critical Revision of the Genus Eucalyptus."

Within the last two years we have received specimens at the State Herbarium from two localities very close to each other, nine to ten miles northward from Esperance. They came from a dwarf mallee 2 or 3 ft. high, and were in bud, flowers and fruit. These were collected separately by Mr. A. R. Main, and Mrs. Stewart within about a year of each other, but the plants in one locality have now been destroyed by cultivation. It would appear that a number of these specimens from the eastern parts of our south coast extend to the Esperance district, as remarked upon in the case of *Eucalyptus scyphocalyx* in a recent number. A point of interest is that the species is very closely related to the Kangaroo Island mallee (*Eucalyptus cneorifolia*) the well known source of eucalyptus oil of high quality. Another point of interest is to be found in the flowers which possess two types of stamens, one long and one short, and with these a certain difference in the size of the anthers. At the present time there is little to remark upon concerning this species.

(*Eucalyptus micranthera* F. Muell, ex Benth.)

A and B—Branchlets showing leaves, buds, flowers and fruits; C—Buds (enlarged); D—Flower; E—Anthers; F—Fruits; G—Section of fruit

(About 10 miles northward from Esperance, A. R. Main, 1959.)

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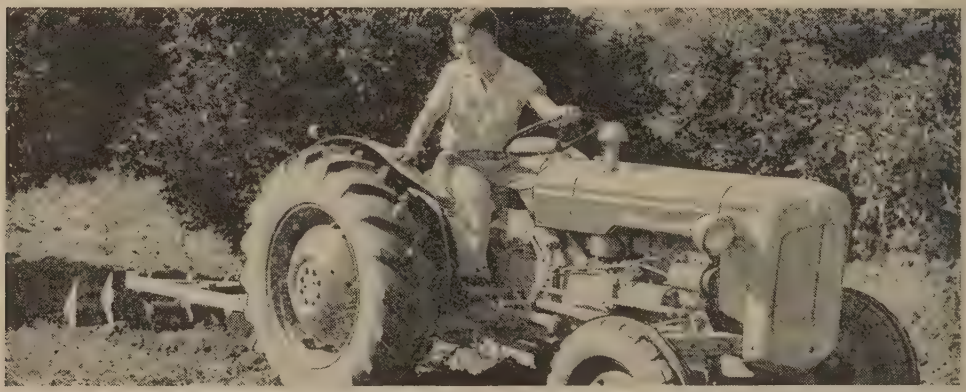

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Fig. 1.—Potatoes under irrigation at Harvey

IRRIGATION IN WESTERN AUSTRALIA

REPORT ON GOVERNMENT-CONTROLLED AREAS, 1958-59

By H. K. GIBSONE, Officer-in-Charge, Irrigation

IRRIGATION in the south-western portion of Western Australia is mainly confined to the coastal plain west of the Darling Range where the three main irrigation districts of Harvey, Collie and Waroona have been established by the State Government. The Government-controlled irrigation areas extend southward from Waroona (70 miles from Perth) to Dardanup (120 miles from Perth) and have an average width of about five miles.

It will be seen by the accompanying table of water utilisation figures that the total area irrigated in all districts during the 1958-59 season was 25,252 acres, a decrease of 168 acres and that the acre waterings were 148,632, an increase of 2,396. The average number of waterings per acre was 5.88 as against 5.75.

Of the total area of 25,252 acres, 75.77 per cent. was used for permanent pastures and a total of 94.7 per cent. was used for permanent pastures, clovers and fodder crops in the production of whole milk and fat stock. Of the water used 88.27 per cent. was for permanent pasture and 96.39 per cent. for dairying and fat stock purposes.

It is interesting to note that over the years the frequency of watering has increased considerably.

Fig. 2.—An irrigated oat crop under controlled grazing by means of electric fences

Fig. 3.—Cattle grazing on irrigated pastures, white clover, perennial ryegrass and paspalum. A supply channel is seen in the foreground

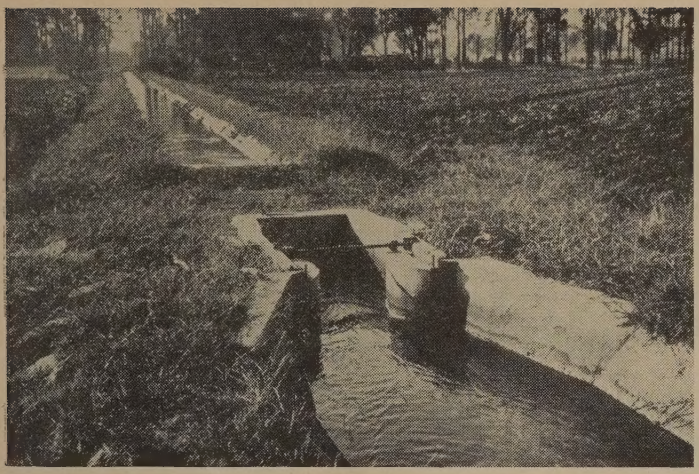

Fig. 4.—A supply channel showing check and cattle crossing near Harvey

In the season 1942-43 permanent pasture was watered 4.36 times per acre and all land 3.18 times. In 1958-59 the respective figures were 6.86 and 5.89.

LAND GRADING AND IRRIGATION AREAS

In the preparation of land for surface irrigation it is recognised that efficient grading of such land is essential. During the past ten years the Department of Agriculture in co-operation with the Public Works Department has made power graders available to farmers at a cost designed to cover only working expenses.

Each season approximately 100 farmers make use of these machines. Since the commencement of these operations, private contractors have entered the field and play an important part in the field of grading.

During the season, 1,640 acres of land were graded in preparation for irrigation compared with 1,815 acres the previous season. Of this total Government-controlled machines handled 865 acres and farmers and contractors 775 acres.

As shown in the table overleaf, the bulk of this land is put into immediate production and consequently has a direct influence on production from the irrigation areas.

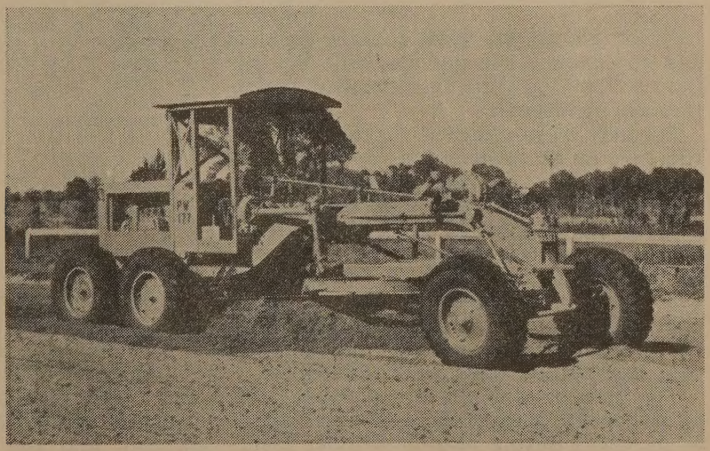

Fig. 5.—Power grader in operation in the irrigation areas

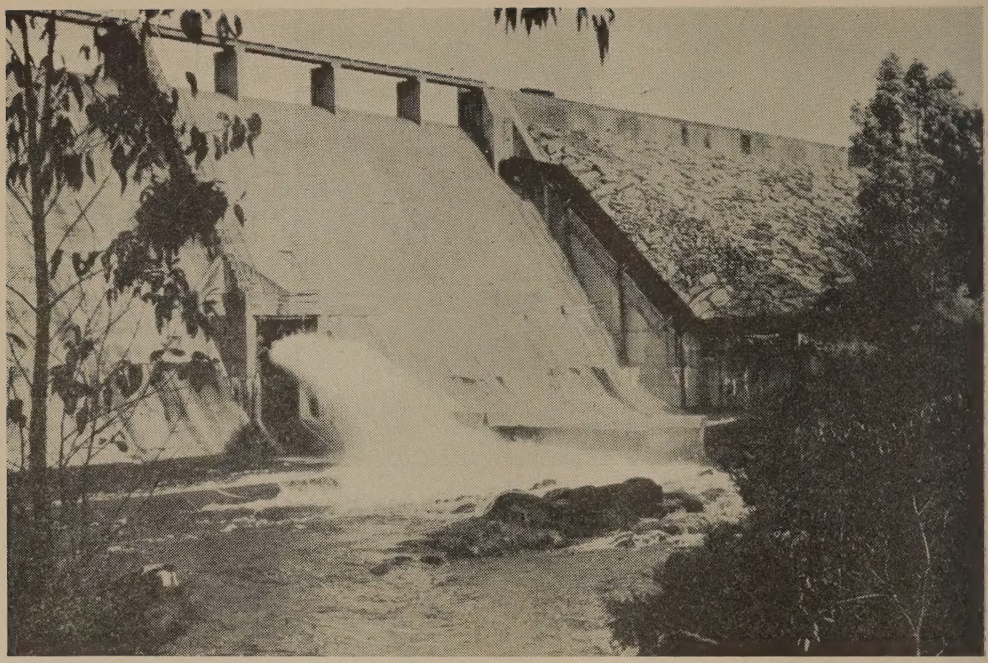

Fig. 6.—Harvey Weir showing the discharge valve supplying water to the irrigation areas

	1957-58	1958-59
Permanent Pastures	749	916
Annual Pastures	268	116
Fodder Crops	518	396
Fallow	17	74
Potatoes	194	97
Vegetables	49	39
Miscellaneous	20	2
Total Area Graded	1,815	1,640

Grading costs for work done by farmers and contractors are not available but the figures for Government-controlled machines are of interest.

Farmers were charged £4 per hour for the hire of these machines as against £4 10s. per hour last year. Drainage work and work not connected with the grading of land was charged at £5 2s. 6d. per hour. The average cost to grade one acre was £7 17s. 9d. compared with £7 4s. the previous season. The average time to grade one acre was 1.97 hours compared with 1.59 hours. These figures include land that has been graded more than once.

The Irrigation Areas are districts with an annual rainfall of 40 in. of which about 33 in. occur during May-September inclusive. Rainfall details are given in the following table:—

Rainfall at Harvey (Centre of Irrigation Areas)

	1956.	1957.	1958.
January	—	17	3
February	3	14	33
March	289	72	—
April	243	308	150
May	1,041	635	697
June	767	1,785	357
July	1,006	427	1,497
August	191	562	358
September	291	240	89
October	72	280	188
November	176	14	114
December	8	9	30
Totals	4,087	4,363	3,516

Harvey (centre of area)—Annual average 4,014 points.
Brunswick (south of Harvey)—Annual average 4,112 points.
Waroona (north of Harvey)—Annual average 4,109 points.
Pinjarra—Annual average 3,784 points.

It will be appreciated that adequate drainage is required to deal with this heavy rainfall and the power graders do good

IRRIGATION WATER UTILIZATION FIGURES FOR GOVERNMENT CONTROLLED IRRIGATION AREAS, 1957–58 AND 1958–59

District	Permanent Pasture		Dry land for Early Winter Feed		Fodder		Potatoes		Vegetables		Pumpkins		Orchards and Vines		Softening		Total Acres	
	57–58	58–59	57–58	58–59	57–58	58–59	57–58	58–59	57–58	58–59	57–58	58–59	57–58	58–59	57–58	58–59	57–58	58–59
Collie	6,469½	6,442	1,857	1,811	412½	499	302	249½	98½	63½	25	21	10	10	28	1	9,202½	9,097
Harvey	10,012	10,378	1,607	1,335	781	714	309	233	92	79	....	26	202	191	....	....	13,003	12,956
Waroona	2,286	2,314	....	....	325	412	142	141	144	120	317	212	....	....	....	....	3,214	3,199
Total All Districts	18,767½	19,134	3,464	3,146	1,318½	1,625	753	623½	334½	262½	342	259	212	201	28	1	25,419½	25,252
Percentage of Land Irrigated	73·83	75·77	13·63	12·46	5·97	6·44	2·96	2·47	1·35	1·04	1·34	1·03	0·83	0·79	0·11	....	100·02	100·00
Acre Waterings	126,588½	131,188	7,017	5,752	5,384½	6,324	3,299	1,857½	1,506½	1,346½	1,441	1,149	972	1,014	28	1	146,236½	148,632
Average Number of Waterings	6·74	6·86	2·03	1·83	3·55	3·89	4·38	2·98	4·37	5·13	4·21	4·44	4·59	5·05	1·00	1	5·75	5·89
Percentage of Water Used	86·56	88·27	4·80	3·87	3·68	4·26	2·26	1·25	1·03	0·90	0·99	0·77	0·66	0·68	0·02	....	100·00	100·00

Permanent Pastures—Consist of perennial species such as paspalum, perennial ryegrass, cocksfoot, etc., in association with white clover and occasionally strawberry clover.

Earlu Winter Feed—Watering of dryland for early germination of annual pastures—consisting of subterranean clover, annual ryegrass and minor clover and grasses.

Fodders—Consist of maize, millets, sorghum and sudan grass chiefly.

Land Graded, 1957–58 season 985 acres Government Power Graders plus 830 acres by farmers and contractors Total = 1,815 acres.

Land graded, 1958–59 season 865 acres Government Power Graders plus 775 acres by farmers and contractors Total = 1,640 acres.

Drains and channels excavated 1957–58 2,309 chains, 1958–59 1,440 chains.

Cost of watering :—Basic rate £1 8s. 9d. per acre. This sum allows two waterings and is a compulsory charge on all irrigated land within the scheme area. All subsequent waterings cost 5s. 9d. per acre.

IRRIGATION RESERVOIRS

District	Reservoir	Type	Depth of Water	Capacity	Acre	Crest Length	Area of District	Ultimate Rateable Area
			feet	gallons	feet	feet	acres	acres
Harvey	Harvey	Concrete	60	2,250,000,000	8,300	797	2,928	2,928
	Stirling	Earth Fill	150	12,000,000,000	44,344	900	29,735	10,077
Waroona	Drakesbrook	Concrete	54	504,000,000	1,855	580	10,325	3,441
	Sampson	Earth Fill	100	1,800,000,000	6,540	800		
Collie	Wellington	Concrete	65	8,700,000,000	31,500	1,200	28,762	9,288
			....	25,254,000,000	92,539	....	71,750	25,734

work in the construction of drains and channels. Approximately 18 miles of drains were excavated during the 1958-59 season.

HARVEY IRRIGATION AREA

The total area irrigated was 12,956 acres as compared with 13,003 acres the previous year. The acre waterings for the season were 79,861, an increase of 1,641. The average number of waterings per acre was 6.17 compared with 6.01 for last year. The area of irrigated pastures increased by 366 acres to 10,378 and the average number of waterings given to irrigated pasture was 7.03 as against 6.94 for last year.

The Harvey area is up to the capacity of the weirs and no increase can be expected until additional storage is provided.

COLLIE IRRIGATION AREA

The area irrigated was 9,097 acres, a decrease of 105 acres. The acre waterings were 50,548, an increase of 961. The average number of waterings per acre was 5.56 compared with 5.39 last season. Irrigation pastures remained practically the same, the figure being 6,442 as against 6,470 for last year.

The average number of waterings given to irrigated pasture was 6.84 compared with 6.63 for last year.

Due to a shortage of water in Wellington dam it is necessary to impose restrictions. Except for special crops and stock water no water is available after the end of March. However, work on the raising of the wall of Wellington dam is nearing completion and it is hoped that full supplies will be available for the district next season.

WAROONA IRRIGATION AREA

The area irrigated was 3,199 acres as against last year's figure of 3,214. The acre waterings for the season were 18,223, a decrease of 206. The average number of waterings per acre was 5.7 compared with 5.73 for last year. Permanent pasture increased to 2,314 acres. The average number of waterings for permanent pasture was 6.11 compared with 6.22 last season.

A DISEASE-RESISTANT CUCUMBER

Department of Agriculture tests of an American cucumber known as Ohio MR200 have indicated that this variety is highly resistant to the mosaic disease which has long been a serious problem in early cucumber crops in this State.

In experiments carried out at the Vegetable Research Station, Herdsman Lake, the imported variety, grown under severe mosaic conditions, gave eight times the yield of the susceptible local varieties. The percentage of first quality fruits was 85 per cent., compared with 12 per cent., 37 per cent. and nil of three local varieties tested under identical conditions.

The new variety appears to be highly suitable for early planting in mosaic-liable areas, but was not at present recommended for mosaic-free situations or for late planting.

Seed supplies are limited at present and only small trial lots are available.